40 Rock ©

POPULAR Computing WEEKLY

35p 8-14 December 1983 Vol 2 No 49

This Week

Street Life
David Kelly talks to Bob Simpson of Program Power See page 15

Breakout
Les Allan presents his own version of the classic arcade game on page 31

Fireworks
John Scriven and Patrick Hall demonstrate a program that explains the four rules of arithmetic See page 24

New Releases
All the latest software including *Ultima Zone* from Tansoft *Chopiifter* from Audiogenic and *The Warlock of Firetop Mountain* from Penguin Books Page 68

STAR GAME
Diver on Spectrum. See page 10

News Desk

New ITV venture to rival BBC?

ITV will decide at the start of next week whether or not it will go ahead to launch its own ITV micro, a rival for the BBC computer

The Independent Television Companies Association (ITCA) will meet on Monday December 12, to decide if it will adopt a machine designed by London based Transam Computers as its own

Transam's proposal for the ITV micro is expected to be a Z80-based CP/M machine with 64K Ram, Centronics and RS232 interfaces and built-in disc interface, selling for the same price as the BBC's computer £399

The independent television companies are known to have been interested in the idea of an ITV micro for some time — particularly for use in a range of new micro-computing programs they are developing and in conjunction with ITV's telesoftware plans using its teletext system, Oracle

A number of ITV companies have expressed concern at the plan The problem is that the proposed computer represents a new departure for independent television, involving endorsement of a commercial product and a possible conflict of interest with advertisers

Whether or not ITV decide to go ahead with the plan Transam still intends to launch the machine The computer was already under develop-

Continued on page 5

Bug-Byte loses claim to fame

A SPLIT at Bug-Byte means that the company will lose its claim to the top-selling Spectrum game *Manic Miner*

Former Bug-Byte employee, Alan Maton left the company in August to set-up a new software house Software Projects *Manic Miner* author Matthew Smith who has a share in the new company has revoked Bug-Byte's licence to produce the game giving it instead to Software Projects

Continued on page 5



Classified

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TI994A, Space Invader module Programme Book 20 games tapes nine months old hardly used £80 ono Tel 0273-731689 Will swap for Spectrum

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HEWLETT PACKARD HP41CV pack of computer + games pack worth £200 Sell for £120 Contact Nick 01-272 7205

Continued on page 51

BRITAIN'S BEST-SELLING MICRO WEEKLY

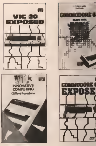
COMMODORE

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Here are four great books from Melbourne House to put you in total control of your Commodore 64 and VIC 20. Each is clearly written with step by step instructions, and fully illustrated. Now you can explore the full potential of your Commodore micro with exciting programs, brilliant new games and innovative programming techniques.

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— Personal Computing
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Commodore 64 Games Book
Teach your Commodore 64 every trick in the book. 30 programs ranging from nerve shattering space games such as Galaxy Raid and Earth Defence, to and role adventures including Sea Harrier and Flight Simulator. You can enter these all yourself by simply following the easy to enter listings.
"For a Commodore 64 games enthusiast this book is a must"
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The definitive book for the Commodore owner. A complete and comprehensive guide that clearly explains every function of your Commodore 64 from BASIC to machine language. This book goes far beyond the data provided in the Commodore user's guide. Includes full details on advanced programming, graphics and sound plus simple demonstration programs that can be entered in minutes.

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POPULAR Computing WEEKLY

8-14 December 1983 Vol 2 No 48

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How to submit articles

Articles which are submitted for publication should not be more than 3 000 words long. The articles and any accompanying programs should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should whenever possible be computer printed.

We cannot guarantee to return every submitted article or program so please keep a copy. If you want to have your own program returned you must include a stamped addressed envelope.

Accuracy

Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish [illegible]

This Week

Editorial

The runaway success of Coleco's Cabbage Patch Kids in the US should not be too surprising. After all, it is not that long ago that a similar enthusiasm for pet rocks and invisible fish swept the United States.

What is ironic is that Coleco is better known as the manufacturer of the Adam micro. However, with the $700 Adam plagued by production problems, it is the Cabbage Patch Kids that are bringing in the money for Coleco. The company hopes to sell nearly 3m of the plastic dolls by the end of this year for an estimated $46m.

The popularity of the Cabbage Patch Kids appears to be founded on their individuality — no two are alike — and their human-like persona. The idea of adopting the dolls, giving them names and sending them birthday cards, is designed to make them part of the family.

With the US home computer market still in a state of turmoil, it is not inconceivable that Coleco could try the same tactics with its micros. People who are apprehensive about new technology might well feel less threatened by a computer with a personality. Marvin the paranoid android from *The Hitch-hikers Guide to the Galaxy* is a familiar and likeable character precisely because he possesses human flaws to go with "a brain the size of a planet".

Anyone want to adopt a computer?

Next Thursday

You, as the last remaining computer on Earth, must guide the last four scientists to the mothership, avoiding asteroids. Abandon Earth — next week's star game for the unexpanded Vic20 (with joystick) by Mark Manns



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PCW 8.12

LOGIC 3

THE KEY IN THE WORLD [illegible]

Bug-Byte

Continued from page 1

As of November 28 when the first of Software Projects versions of *Manic Miner* arrived in stores both companies have been competing for sales of the title This curious situation will continue until Bug-Byte unable to manufacture any further copies of the game runs out of its existing stock

'We have about 50 000 cassettes which should last us over the Christmas period and into February ' said Bug-Byte director Tony Milner

Commented Matthew 'Bug-Byte are a bit peeved but I cancelled their licence because it makes more sense for me to licence it to a publishing house in which I have my own share of ownership

Matthew Smith s decision to switch to Software Projects has other implications for Bug-Byte

Matthew s follow-up to *Manic Miner Jet-set Willy* for the Spectrum will be launched this week by Software Projects, as will *Manic Miner* for the Commodore 64 machine The company hopes to convert *Jet set Willy* for the Commodore 64 before Christmas

In *Jet-set Willy* the diminutive hero having made piles of money from digging underneath Surbiton has joined the jet-set He now lives in a huge 64 room mansion and frequently holds riotous parties One night after just one such debauched occasion the last guest has just left and Willy prepared for bed only to be stopped by his housekeeper Maria who insists that he must collect up all the glasses from the various rooms and return them to the kitchen

Software projects is offering a prize to the first player of the game to correctly identify the number of champagne glasses to be collected The winner will receive a set of six glasses and a bottle of champagne together with "a taste of the jet-set life" — a spin around his or her locality in a Jet Ranger helicopter

On his eighteenth birthday in February next year Matthew will become a director of Software Projects owning a little less than one-third of the company The other directors are Alan Maton and Tommy Barton a Liverpool businessman

So far Bug-Byte has sold 40 000 copies of *Manic Miner* earning Matthew around £10 000 in royalties

Conversion of Matthew s games to the Commodore 64 for Software Projects is being carried out by Chris Lancaster, author of *Bewitched* published by Imagine

Software Projects are located at The Bear Brand Complex Allerton Road, Woolton, Liverpool L25

ITV vanture

Continued from page 1

ment prior to the approach to produce an ITV machine and it is scheduled to be launched at the *Which Computer?* Show at the NEC in Birmingham in February

● The new Transam computer is a low cost development from its existing machine the Tuscan The Tuscan is a £1 700 64K CPM business machine with a built-in twin 5¼ inch floppy disc drives

First wrist computer from Seiko

JAPANESE manufacturer Seiko has announced what it claims is the world's first wrist watch computer

The device which will go on sale in Japan in January, is in three parts a wrist unit containing 2K Ram and a liquid-crystal display, a miniature keyboard not much bigger than a credit-card which communicates with the wrist unit via a remote electromagnetic link a a larger A4 paper size controller device

The controller is used to program the computer using standard Microsoft Basic Programs up to 2K in size can then be run using the keyboard and display units working independently of the controller unit

Prices are Y19 000 (£55) for the wrist display Y6 000 (£18) for the keyboard and Y29 800 (£80) for the controller

Seiko UK hopes to sell a simplified version of the wrist-watch computer in this country in April next year

Dragon upgraded to 64

DRAGON Data has at last announced its scheme to allow Dragon 32 owners to upgrade to a Dragon 64

Since April when the company first announced its intention to offer an upgrade the cost has doubled and the way the offer will be carried out has changed

It will now cost Dragon 32 owners £140 to end up with a Dragon 64 and the upgrade, not now in the form of a circuit board swap, will be a straight part-exchange deal

From mid December registered owners of the Dragon 32 will be able to return their machines to Dragon in Port Talbot and get an £85 discount off a brand new Dragon 64 computer

A 64K machine is necessary in order to run the OS9 disc-operating system software now being offered by Dragon

Although the offer is considerably more expensive than originally suggested, and comes six months later than planned it is more than Sinclair offered ZX81 owners or Commodore gave to Vic20 purchasers

Coleco adopts a doll

COLECO s continuing difficulties with manufacture of its much-heralded Adam computer may be eased by a controversial toy doll

Amid reports of faulty Adam machines and serious shortages in the shops for Christmas — less than a third of the 400 000 units originally hoped for will be delivered — Coleco is struggling to cope with the runaway success of its Cabbage Patch Kids toy dolls

Around 2 5m of the toys will be sold this year bringing Coleco a much-needed $50m

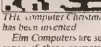
The Cabbage Patch Kids have provoked an astonishing reaction from American shoppers with fights breaking out in stores scrabbling for the few remaining toys

In this country the hysteria has continued with Harrods reporting 200 yard queues of hopeful Cabbage Patch owners waiting to be parted with £24 a head

The reason for their success is two fold First every Cabbage Patch is different — individually designed by computer to ensure it is unique

Secondly no Cabbage Patch is purchased Every Cabbage Patch Kid delivered from the Babyland General Hospital, complete with an injection of TLC (Tender Loving Care) is waiting to be adopted Each 'parent' completes adoption papers and names the Kid On the Patch Kid s first birthday it will receive a card wishing it a fine day from Coleco

Happy Xmas



THE computer Christmas card has been invented

Elm Computers are selling a range of three animated seasonal greetings on cassette for the BBC machine

The Christmas programs are priced at £2 50 each (all three for £7) available from Elm Computers 59 Bateman Road East Leake Loughborough Leicestershire

Micro Shows

The BBC Micro User Show will be held at the Westminster Exhibition Centre, London SW1 from December 8 to 11 Entry is £3 and £2 and the show is open between 10 am and 6 pm on Thursday Friday and Saturday, and between 10 am and 4 pm on Sunday

The *Young Computer* Christmas Fair takes place at the Wembley Conference Centre a week later Entry to this show is £2 50 and £1 50 and the opening hours are as follows Thursday December 15 10 am to 6 pm, Friday December 16, 10 to 8, and Saturday and Sunday, December 17 and 18 10 to 6

Romik Forth

ROMIK has developed a Forth language package for the Commodore 64

The new Forth version has over 200 pre-defined command words has a built-in editor and is supplied with a 64-page manual Romik fig-Forth has been written by Brian O Shaughnessy is supplied in cassette form and costs £19 99



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High standards

Congratulations I must say that this is the best weekly (and second only to *Sinclair User* overall) I have ever read and boy I've read a lot I have read just about every computer magazine at least once and a very small number come even close to your standards — none for as little as 35p

As for the high score saga, I think you need ask for no proof as no matter what you come up with people could still beat it and other honest people (the majority by far) would not be able to give the required proof even with a legitimate score At home we keep a book of high scores for our friends and family and the only proof we demand is that the score is shown to one other witness

Many magazines (eg *Computer and Video Games*) have high score spots and ask for no photo of the screen or other proof, but trust the readers I know there are some pranksters, but we could ignore any totally preposterous scores and put up with any of the stupid minority

A high score spot would vastly improve this mag, so stop messing and get on with things at your end Keep up the good work, *guys*

S Kezik
13 Rutland Close
Kippax
Leeds

Stop and think

I appeal to everyone who will be buying, giving or receiving computer games this Christmas to stop and think before making their choices I put it to you that encouraging young people to play games the purpose of which is to kill bomb shoot, conquer destroy and show as much aggression as possible is as sick as forcing them to watch 'video nasties' — in fact, it is sicker because with computer games they must actively participate

It is a tragedy that whilst British home micro software leads the world in technical quality the vast majority of the themes of 'games' appear to have been thought up by the minds of mass-murderers to give pleasure to admirers of Adolf Hitler, Jack the Ripper and Attila the Hun Look through the adverts in this magazine and feel shame

We have allowed this to happen, and we are all responsible, programmers, advertisers, magazines and shops We are using the greatest innovations of our age to teach kids that killing is OK Pick your presents with care Happy Christmas Peace and goodwill to all mankind and aliens

Mel Croucher
Automata

Ant attack

I would like to say sorry to D Claypole about his score of 33,106 on *Ant Attack*, as I have also rescued all 10 victims but in a shorter time which resulted in a score of 41,412 Can anyone beat that?

Bruce Vivers
Skiddaw
Carlisle Road
Annan
Dumfriesshire

A budding genius?

Although not wishing to get involved in a personal vendetta with any of your readers, I feel I must reply to Lance Rock's letter (*PCW* 24-30 November)

My first point is that having just attained my 13th birthday, my parents inform me that I should be on a continual ego trip for some years yet However, being a budding genius, I had not realised this and I must thank them and Mr Rock for bringing this to my attention

Secondly, not everybody, like Mr Rock, is a mature and avid reader of *PCW* Unfortunately, there are some young members of the human race who are just becoming involved with computers and software, and also this magazine, and after being asked by several of them where they could buy *Vetpac* and *Trantam*, I felt it necessary for my ego to try to save *PCW*'s publishing team from answering five or six queries on the matter

Thirdly, not wishing to pry into Lance Rock's private life, I was wondering if he could let us all know who Diane is

Lastly, but not leastly, I must bless Lance's little cotton socks for taking the time and trouble to read and answer one of my humble letters Rock on Lance Keep up the good work

Craig Mitchell
28 Kirkstall Road
Hollin
Middleton

PS If you think this letter is 'a waste of space', perhaps you would consider serialising it in four weekly parts

Diane, for anyone who does not know, is Diane Davis, our classified executive.



"We're calling him Adam because my dad really wanted a home computer"

Sinclair microdrive

I wonder if you could clarify me on a point which I am sure many readers will be asking themselves Does the Sinclair Microdrive have an interface by which it can connect to non-Sinclair micros? I am sure many people would be more than willing to have this 'cheap and versatile little peripheral for use with their own non-Sinclair micros

I have asked in many computer shops and just received blank stares I have never come across any advertisements for what I am sure would be a quick-selling interface, and not just for the Spectrum

Also, do you know of any interfaces for the ZX printer to make it compatible with non-Sinclair micros? This low cost add-on is more than adequate for someone who just wants a printer for program listings

Patrick McDaid
31 Edge Fold Road
Worsley
Manchester

To the best of my knowledge, no one has produced an interface to link the Microdrive to non-ZX micros . . . yet. I am sure such interfaces will arrive, but not until you can buy the Microdrive in the shops as opposed to mail order.

However, there are a number of companies producing interfaces to link the ZX printer to other micros. Softex Computers of Bournemouth, for example, offer an interface and power supply for £20 95 to enable you to run a Sinclair printer on either the Vic20 or the Commodore 64.

A useful Poke

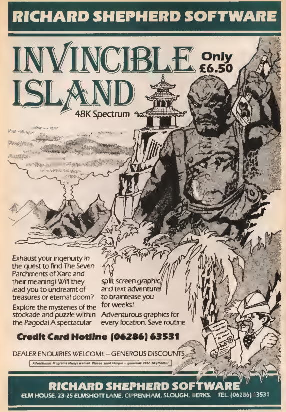
One of the most useful *Pokes* available on the Spectrum is *Poke 23613 Peek 23730-5*, which disables the Break key after program execution This *Poke* traps all errors except *'Nonsense in Basic'* and can cause a crash if others like *'Integer out of range'* appear

To stop people breaking programs whilst loading, the commonly used *Poke 23659 0* will cause a crash if the break keys are pressed — this is because the poke sets the number of lines in the lower half of the screen and error reports cause an irreversible black screen to appear However, this *Poke* must be used with care, as it will take effect on any attempt to *Cls* To avoid this the location must be temporarily reset eg *Poke 23659,2 Cls Poke 23659,0*

Also, I thought I'd let you know of my current high scores *Penetrator* — 237,650, *Manic Miner* — 497,313 (about 14 times round), *Chuckie Egg* — 437,100

Finally, can I second the suggestion for a high score table over popular games, with concrete proof such as photographs or several independent witnesses

Carl Lyons
6 Hadrians Close
Salendine Nook
Huddersfield


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Diver

A new game for 16K and 48K Spectrum by John Durst

You find yourself in an underwater cavern, full of rocky stalactites Dressed in full diving gear you are dropped through a shaft into the cavern Your task is to find — and bring back — the sunken treasure

You carry a type of sonar your diving suit changes colour depending on how close you are to the level of the treasure, so that when your diving suit turns white, you know you must be roughly on the right level — although you cannot see the treasure When you get quite close to it, you activate a transponder which lights up a beacon on the treasure

Moving about (using the Spectrum cursors) you must try and locate the treasure and get your arms round it, before heading for home

But you don't have things all your own way, there are Sting-rays lurking which will zap you with an electric shock if you come within range (You can't see them either) They don't do too much damage but the shock bumps up your heart rate and you use up extra oxygen from your back pack

Normally, you can't get through the rocks but in an emergency you can use your blaster (by hitting "•) which will smash the rock in your immediate vicinity But this always wakes the sleeping Octopus, who will make a bee-line for you, emitting clouds of black ink! You had better have your route home planned, or he will catch you.

Scores are shown at the end and there's the chance of another try in a different cavern

Notes

This looks a seriously long program to enter but it's not quite as bad as it seems A number of lines are very similar and can be entered using the *Edit* mode to change line numbers and variables after the first one has been entered

The following are groups of similar lines 36 50 70 71 72 85 90 216-219 220-225 230,231 232,236 240 241 242 243 1100-1140 1200-1240 2705 3035 3060 4100

The cumulative score is *Poked* into *USR T* and *USR U* in the User Defined Graphics These positions are normally blank (they code for the space between lines of print) and are not lost when the program is Run It does of course mean that you can't use mode two graphics The letters in quotes in lines 215,227 2510 3030 are also UDGs

Line 15 draws the Diver and the treasure The main loop of the game is between 215 and 280 it is fairly complicated so the game isn't very fast. But one can't move fast under water anyway ■



```
1 REM DIVER
2 REM Initialise
8 BORDER 0: PAPER 0: CLS
10 DIM a(32): FOR j=1 TO 32: LET a(j)=7: NEXT j
15 DATA 84,56,56,60,126,255,189,189,189,189,60,102,102,102,66,56,102,186,195,24,24,195,185,102
20 FOR j=0 TO 23: READ n: POKE 65368+j,n: NEXT j
25 LET t=PEEK USR "T"+256*PEEK USR "U"
30 LET sc=0: LET st=0: LET oc=0: LET oh=30: LET ov=20: LET tr=7: LET at=22527
35 FOR j=1 TO 32: POKE at+j,a(j): NEXT j
40 FOR i=2 TO 20
50 FOR j=1 TO 32: POKE at+j,a(j): NEXT j
60 LET at=at+32
70 LET x=1+INT (RND*30): LET a(x)=15: LET a(x+1)=15: LET a(x+2)=15
71 LET x=1+INT (RND*30): LET a(x)=15: LET a(x+1)=15: LET a(x+2)=15
72 LET x=1+INT (RND*30): LET a(x)=7: LET a(x+1)=7: LET a(x+2)=7
80 NEXT i
85 FOR j=1 TO 64: POKE at+j,10: NEXT j
86 FOR j=66 TO 96: POKE at+j,7: NEXT j
90 GO SUB 1000
95 LET trx=5+INT (RND*25): LET try=INT (RND*18): IF ATTR (try,trx)<>15 THEN GO TO 95
96 IF ATTR (try-1,trx)<>7 THEN LET try=try-1: GO TO 96
100 LET s$="                                "
105 PRINT #1;AT 0,0; PAPER 1; INK 9;"Oxygen Supply ";TAB 32;s$: PRINT #2;
110 LET q=32
150 REM Dig diver's shaft
170 LET y=0
180 IF ATTR (y,4)=15 THEN GO TO 200
190 PRINT AT y,4; INK 7; PAPER 1;" ": LET y=y+1: GO TO 180
200 REM Move diver
210 LET x=3: LET y=0
215 PRINT INK 7-ABS (try-y)/4; PAPER 8;AT y,x+1;" ";AT y+1,x;" A ";AT y+2,x;" B ";AT y+3,x+1;" "
216 FOR j=1 TO 8: IF ATTR (y+1,x-j)=7 THEN GO TO 220
218 IF ATTR (y+1,x-j)=10 THEN GO TO 1100
219 NEXT j
220 FOR j=1 TO 8: IF ATTR (y+1,x+j)=7 THEN GO TO 226
222 IF ATTR (y+1,x+j)=10 THEN GO TO 1200
225 NEXT j
226 IF try=y+1 AND trx=x+1 THEN LET tr=1
227 IF (ABS (try-y)<=3) AND (ABS (trx-x)<=3) THEN PRINT AT try,trx; PAPER 8; INK tr; BRIGHT (tr=7); FLASH (tr=7);"C"
228 LET q=q-.2: LET s$(q)=" ": PRINT #1;AT 1,0; PAPER 1;s$: PRINT #2;: IF q<1.5 THEN GO TO 3000
229 PAUSE 0: LET y$=INKEY$
230 IF y$="5" THEN LET x=x-1: IF ATTR (y+1,x+1)<=7 OR ATTR (y+2,x+1)<=7 THEN LET x=x+1
231 IF y$="8" THEN LET x=x+1: IF ATTR (y+1,x+1)<=7 OR ATTR (y+2,x+1)<=7 THEN LET x=x-1
232 IF y$="6" THEN LET y=y+1: IF ATTR (y+2,x+1)<=7 THEN LET y=y-1
233 IF y$="7" THEN LET y=y-1: IF ATTR (y+1,x+1)<=7 THEN LET y=y+1
240 IF x<0 THEN LET x=x+1
241 IF x>31 THEN LET x=x-1
242 IF y>18 THEN LET y=y-1
243 IF y<0 THEN LET y=y+1
250 IF x=3 AND y=0 THEN GO TO 4000+(80 AND tr=7)
260 IF Y$="*" THEN GO SUB 2500
265 IF oc=1 THEN GO TO 2600
270 BEEP .01,RND*10
280 GO TO 215
1000 REM Sting rays
1010 FOR j=0 TO 10
1020 LET x=1+RND*29: LET y=RND*20
1025 IF ATTR (y,x)=7 THEN GO TO 1020
1035 PRINT AT y,x; PAPER 1; INK 2;"<"
1040 NEXT j
1050 RETURN
1100 PRINT AT y+1,x+1; PAPER 8; INK 8; OVER 1; BRIGHT 1;" "
1105 FOR i=0 TO 9: PLOT INK 8; OVER 1;(x-j)*8+4,163-y*8
1110 DRAW INK 8; OVER 1;8*j-1,0
1120 BEEP .01,2: NEXT i
1125 LET q=q-.5: LET s$(q)=" "
1130 PRINT AT y+1,x+1; PAPER 8; INK 8; OVER 1; BRIGHT 0;" "
1140 LET st=st+1: GO TO 227
1200 PRINT AT y+1,x+1; PAPER 6; INK 8; OVER 1; BRIGHT 1;" "
1205 FOR i=0 TO 9: PLOT INK 8; OVER 1;(x+j)*8+4,163-y*8
1210 DRAW INK 8; OVER 1;-8*j+1,0
1220 BEEP .01,2: NEXT i
1225 LET q=q-1: LET s$(q)=" "
1230 PRINT AT y+1,x+1; PAPER 8; INK 8; OVER 1; BRIGHT 0;" "
1240 LET st=st+1: GO TO 227
2500 REM Blast
2505 IF x<=5 AND y<=18 THEN RETURN
2510 PRINT INK 7; FLASH 1; PAPER 1;AT y,x+1;" ";AT y+1,x;" A ";AT y+2,x;" B ";AT y+3,x+1;" "
2520 FOR j=0 TO 50: BEEP .01,0: NEXT j
2530 LET oc=1: RETURN
2600 REM Chase
2610 PRINT AT ov,0; PAPER 8; INK 0;
2615 LET oh=oh-SGN (oh-x): LET ov=ov-SGN (ov-y)
2620 PRINT AT ov,oh; INK 8;
2630 BEEP .1,-30: PRINT AT ov,oh; PAPER 0; INK 8;"00"
2650 IF oh=x AND ov=y THEN GO TO 2700
2660 BEEP .01,0
2670 GO TO 215
2700 PAPER 0: CLS : FOR j=40 TO -20 STEP -1: BEEP .01,2+j: NEXT j
2705 LET x=1: POKE 23560,0: POKE USR "T",0: POKE USR "U",0
2710 PRINT AT ov,oh; INK 8;"00"
2720 PRINT AT 10,1; INK 7;"TOO LATE! THE OCTOPUS GOT YOU";AT 20,3;"ANY KEY FOR ANOTHER GAME"
2730 PAUSE 20: IF PEEK 23560<>0 THEN RUN
2740 PRINT AT ov,oh; INK 8;"  "
2750 LET ov=ov+x: LET x=x-(ov>=27)
2760 PAUSE 20: BEEP .1,-30: GO TO 2710
3000 REM Death
3010 FOR j=y TO 19
3020 PRINT INK 6; PAPER 8;AT j,x+1;"0"; INK 4;AT j+1,x;" A ";AT j+2,x;" B "
3025 BEEP .1,-10-j
3030 NEXT j
3035 POKE USR "T",0: POKE USR "U",0
3040 PRINT AT 5,0; PAPER 8; INK 9;"TOO LATE! YOU DIE OF SUFFOCATION"
3050 PRINT AT 10,4; PAPER 7; INK 0; FLASH 1;"ENTER FOR ANOTHER GAME"
3060 IF INKEY$<>CHR$ 13 THEN GO TO 3060
3070 RUN
4000 REM Win
4005 FOR j=0 TO 21: PRINT AT j,0; PAPER 1+RND*5;s$: BEEP .02,RND*5: NEXT j
4010 PRINT AT 4,0; PAPER 1; INK 7; FLASH 1;"YOU GOT HOME WITH THE TREASURE!"''"YOU HAVE ";INT q;" UNITS OF OXYGEN LEFT"''"THE STING-RAYS GOT YOU ";st;" TIMES"''("YOU BRAVED THE OCTOPUS" AND oc=1)
4070 LET sc=INT 10*q-2*st+(100 AND oc=1): LET t=t+sc
4075 POKE USR "T",t-256*INT (t/256): POKE USR "U",INT (t/256)
4080 PAPER 7: INK 0: PRINT ''"YOUR SCORE THIS GAME IS ";sc
4085 PRINT 'YOUR TOTAL SCORE IS ";t
4090 PRINT AT 20,5;"ENTER FOR ANOTHER GAME"
4100 IF INKEY$<>CHR$ 13 THEN GO TO 4100
4110 RUN
```



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Power games

***David Kelly** talks to Bob Simpson of Micro Power*

Micro Power, through its software division, Program Power, has been responsible for some of the best-selling games for the BBC computer — *Killer Gorilla* and *Escape from Moonbase Alpha*, to name but two.

Bob Simpson began it all as long ago as 1979 when he was still working as an accountant for a textile company. Having gained some programming experience through his work, he splashed out and bought a Nascom 2. "I noticed that nobody was doing anything on the programming side for the machine," explains Bob.

So he joined the local Nascom club and decided to have a go. "We began by booking a £30 advertisement in *Practical Computing*."

Next Bob met John Haig, now Micro Power's technical director. "John had bought an Acorn Atom and written nine or ten programs for it and we got together to sell them."

In July 1981 Bob gave up his job with the textile company and was joined by John — from then on Program Power became a full-time occupation. Carol Simpson also joined the company to handle marketing and distribution.

The combination worked. The number of Atom programs grew, so did the company. Eventually Program Power's Atom catalogue contained over 60 titles. Most successful of these was the *Programmer's Toolbox*. The 4K Eprom added useful Toolkit commands and additional Basic keywords to the Atom machine. The package was written by three of Program Power's by now considerable roster of freelance programmers.

In May 1982 the company applied for, and was granted, an Acorn dealership. This coincided with a move to new premises with a shop unit so that a computer shop could be set up. At this point Micro Power was formed as the retail outlet, with Program Power remaining the software development company.

"We started the shop off with 20 Atoms and some of Acornsoft's titles, as well as our own. It was a bit of a struggle to sell the machines, because the Acorn Atom was already on its way out.

"Then the first BBC machines came in and they sold out almost immediately — we had to wait until September for the next lot which also sold out. "Since then we have sold a hell of a lot of BBC machines."

Recently the company has moved again to larger shop premises and Micro Power now sells the Oric, Dragon and Spectrum, as well as the BBC computer. Last month the Electron was added. Next will be the Memotech computers.

The first BBC software titles from Program Power were out in June 1982.

Eighteen months, and over 50 BBC titles later, the process starts again with the Electron. Program Power has 12 programs out for the new Acorn machine already and has sold 50,000 Electron tapes to W H Smith to sell alongside whatever stocks of Electrons they can lay their hands on.

W H Smith would appear to be confident the Electron will do well. Bob: "They bought from us at a time when they knew they wouldn't get many Electrons this year."

Bob could have warned W H Smith what they were letting themselves in for with the Electron. "In the past we have actually lost money at the shop with late delivery of Acorn products — pre-Christmas orders delivered in March, single disc drives arriving six months after being ordered.

"The most frustrating thing is we never know what is happening. If they *told* us it was going to be six months late we would know where we stood.

"Having said that, I cannot emphasise too much our approval of the Acorn products. When they are there, they are tremendous."

Just how long Micro Power will continue to sell home computers is not certain. "A dealer such as ourselves can offer a wealth of expertise that a high-street chain cannot match, but sales of the Spectrum in the major stores has shown that you don't need that back up to sell a computer.

"In the same way that people go to a specialist shop to ask the technical questions about hi-fi, only to go down to Comet to buy, they are now beginning to do the same with computers.

"How long we will have an advantage over the big stores is not clear. Smith's, for one, is setting up some shops with bigger computer departments, staffed by people who do know what they are talking about.

"It may well be that in two years time Micro Power will not have a home computer hardware business. Margins on machines like the BBC are very slim and to think of carving it up to be competitive doesn't make sense."



Forseeing problems in competing with the high street multiples has spurred Micro Power to diversify. The company is shortly to begin selling business micros and it seems likely that other companies in a similar position will also have to make the switch from home to business machines. The smaller retailer of home micros will be forced out by the big chains and when they go, so too will go a valuable source of help and advice.

Although Program Power — the software side — contributes slightly less than half of the £750,000 turnover of the whole company, Bob regards software as the mainstay.

Currently, Program Power has 43 titles for the BBC machine. Last month 15 new titles were added and 17 were removed from the catalogue. The titles discontinued were the older games. Since they were written, the quality of software on the BBC has improved so much that they were no longer considered to be earning their place.

In addition to the 12 titles which have so far been converted for the Electron, 20 more will be out before Christmas. From now on, each new title will appear simultaneously for both the BBC and Electron.

Converting programs from the BBC for the Electron is not always as straightforward as it might appear. *Moon Raider* and *Swoop*, the latter being one of Program Power's top-selling titles, were both written in Mode 2 on the BBC and both have had to be rewritten in Mode 5 for the Electron.

"The main problem with the Electron," says Bob, "is speed. In Mode 2 it runs at about a quarter the speed of the BBC. This has meant making compromises. Sometimes this means we have had to have smaller characters or reduce the number of shapes on screen at one time."

Program Power intends to continue to specialise in games software because they sell well. "For any new title now we are looking for minimum sales of 10,000 copies in six months."

Assuming the Electron sells at least half as well as the Spectrum, Bob reckons a top title next year ought to sell between 50,000 and 100,000.

Sales of the Electron itself will clearly depend on how Acorn brings down the price. The BBC machine might well have come down to £300 by now if keeping the price up had not been a condition of Acorn's agreement with the BBC. And Acorn would have sold so many more machines at £300 than £400.

"The Electron has most of the capabilities of the BBC and ought to do well. At the moment I can see no reason why Program Power shouldn't go on strongly for two or three years at least.

"We are looking at the Commodore 64 machine for software next. We will have to work quite hard, though, to establish ourselves as a Commodore 64 software house. It is strange but even if you have quite a big name in software for one computer, people with other micros don't know you exist." ■

Empire of the Dragon

***Brian Cadga** looks at another batch of software for the Dragon*

We begin this look at the latest Dragon software with a footnote to my review of *Personal Banking System* (PCW 8 September) by Hilton Computer Services As I said then the program has a number of programming errors and oversights which might make it less suitable as a serious package I am now pleased to say that since this review Hilton has sent me a revised version of the program which seems to be totally error free and much more suited to its task

Two other packages also came from Hilton to be included in this review, these are *Utilities No 1* and *Disassembler* Both are written in machine code and autorun on loading

Utilities 1 contains three options selected from a menu on the screen *Cassette Catalogue* will display the name and length of any programs on a cassette as well as ' start and 'entry addresses for binary files The program also reports any block errors but not the block number *Cassette Copy* will automatically copy any standard format Dragon tape up to 22 5K including protected software — it was only a matter of time before a "Copy cat" type program was brought out for the Dragon

The final utility will compress a Basic program removing all spaces and REM lines Doing this certainly saves you memory (how many programs use all 32K though?), but you would be advised to keep a normal copy of the program as it becomes difficult to follow and debug once compressed. Three utilities on one tape for only £5 is not bad value at all I suspect that the *Cassette Copy* routine will sell the tape



The *Disassembler* from Hilton is a full 6809 disassembler which sits in the top 2K of reserved RAM Output is either to screen or printer and is fully formatted in Hexidecimal and standard Motorola mnemonics Little more can be said about a disassembler, this one at £5 is very good value and complements many assembler cartridges on the market very nicely

Also available from Hilton is a Dragon memory map which lists in more detail than any other I have seen most of the useful memory locations of the Dragon It comes in the form of nine A4 photocopied sheets bound by a plastic spine — the price tag is rather high at £5 but dedicated machine code programmers may find it useful

Yet another file handling program is available from Micro-de-Bug software — *Pro file* comes on a cassette with a 56-page manual which explains in very great detail how to Create Delete, Edit Find, List Load and Save files using the cassette system The manual is one of the best of its kind that I have seen — ideal for the absolute novice to computing Unfortunately in the copy I have at least there is no disk support — a disk version or routine would be an obvious advantage to a program of this kind This piece of software carries the usual high price of Professional programs at £10

After all those utilities on to lighter things *Chateau* from Gem software is a new style of adventure game In fact the usual things apply you must roam the old Count s Chateau in search of treasures and clues avoiding booby traps and fighting off the occasional monster or run away from it as you wish!

The difference is that all communication with the program is via menu selection I have seen this tried before without much success but no such problems here the concept works very well and makes the game particularly suitable for younger users who have difficulty typing in long commands correctly

The game is a text only adventure except for a plan which can be called up at any time and which shows your recent movements on the current level There are



four floors to the chateau all of which must be visited to gain all four clues Occasionally a travel agent appears and randomly moves you to a new location — sometimes this helps, sometimes it hinders When all clues have been collected there is another section to the game, similar to *Mastermind* where you must guess the correct sequence of numbers Get past this and you at last get the loot.

As the chateau s locations are randomly generated for each game it is not possible to map out the locations as in most games of this type but it does mean that you get a different game each time As adventures go this one is very enjoyable to play with fast and often witty comments from the computer Whether you like the menu method of entering commands is a matter of taste

Cable Software s latest talking game is *Baccarat* — the card game In case you're not familiar with the game it could be described as similar to Pontoon but the object is to get nine rather than 21 The high resolution graphics used for the cards are truly excellent especially in colour the sound effects are also good although the only speech heard is "Banco" which is only recognisable as such after reading the instruction sheet The cassette comes in Cable s usual full colour mini-video box with a price tag of £8 75

I have no grumbles about the program itself but the choice of game is just not suited to a computer Two cards are dealt by the computer — if the total is more than ten then ten is subtracted if the total is then less than five another card is dealt, if more than five you have to stand (stick) As you will have gathered this means there is no participation by the player at all unless he gets five In which case you choose whether to draw or stand The software may be good but the game is very, very boring!

Hornet Software is a new name in the Dragon software market their first offering is *Wormtube* this is in fact another US convert from the Tandy Colour Computer The idea of the game is to control your FTL (Faster Than Light) space craft as it flies down the wormtube created by such speed Of course you must avoid the

edges of the tunnel as well as shoot gold nodules which block your way picking up gold pieces in your ship s jaws also gain extra points

The scoring mechanism is rather strange you begin with 3 million points and lose up to 50 000 points each time you crash The controls are the right joystick to control the ship s movement, the F key to speed up S to slow down, *Break* freezes the action — a useful feature — and P lets the next player have a go Up to four players can take part and each can enter their name at the start of the game

Using a graphics mode not available in Basic gives a black background with all eight colours and a reasonable level of graphics For an American import this game seems rather uninspired compared to those brought over by the likes of Microdeal The packaging doesn t help — just a small instruction sheet You will probably find the game enjoyable at first, but the novelty soon wears off

War games are becoming ever more popular these days especially those based on the original *Risk* board game *Empire* from Shards Software is the newest The Dragon Empire is a ruthless, aggressive power intent on conquering the world through an uncompromising strategy of relentless attacking says the scenario

The game in which you control the defending armies has eight skill levels and is played entirely on a high resolution colour map of the world You begin by choosing your territories and allocating armies to each When this is all odne, the Dragon does the same The war then begins the display sndws a close-up of the area involved as the Dragon makes its first attack You can follow who s winning at the bottom of the screen You then have 20 seconds to enter your attack, if victory is yours, you can move between one and nine armies to occupy the territory, you then continue attacking if you wish There are also neutral armies involved which can be engaged if desired The ultimate winner of *Empire* is whichever side completely destroys the other first

The display is one of the game s strongest points — a very good world map with close-ups makes the game semi-educational A complete war can take an hour or so to play so this is the ideal game as the winter nights draw in No joysticks are needed as all input is via a simple keyboard command At only £7 this is one of the best tapes to come from Shards for a long time

Finally in this review to two pieces of software from Microdeal *Frogger* is the official licensed version by Sega for the Dragon The game is extremely accurate to the original with full colour high resolution graphics and sound Even the music at the start is the same as the original

You can choose either keyboard or joystick control fast or slow speed and one or two players All the favourites are here the lanes of moving cars and lorries, the snakes diving turtles, logs, crocodiles and white frogs However although the instructions explain how to load and operate the program they assume everyone knows all



the rules and features of the original Frogger game — a little more information would have been useful

The game may be freezed or ended at any time, and you can freely change speed and keyboard/joystick control before each game Bonus frogs are rather hard to come by but they are occasionally given The game gets harder the longer you survive and there is a bonus for each screen completed with some suitable and catchy music

Altogether for £8 this game is fantastic value for money and will keep you amused for a long time to come — a must for all Dragon collections!

If you get jealous of the type of music produced by games like *Frogger* or *The King* then the *Dragon Composer* from Microdeal is just what you need This amazing program gives you not one but four channels of sound, each independently controlled with seven octaves variable tempo and key and an optional *Kaleidoscope* graphics display as the music plays

Once loaded you enter your music in Data statements from line 3000 onwards in simple note format, eg, *Data G4C3B4A2W* Then run the program and a menu is displayed to allow loading and saving, testing and compiling or modifications to be made Each set of notes takes one second to compile and any errors detected are reported Once this is done and you are happy with the results, you save the music at a position independent machine code program You can then load this back into your own programs and play the music with *Exec*

All this is fully documented in a 26-page user manual which comes with the book sized package Also included on the tape is *Jukebox* which plays a number of demonstration tunes including *The Mexican Hat Dance* and *Yellow Rose* The sound produced by this program really has to be heard to be believed — four voices from a single channel source is a masterpiece of programming! Even though this is twice the price of Microdeal s other software at £15 it is well worth it and deserves the full ten-out-of-ten for value ■

Firm	Program	Price	Value (1-10)
Hilton Computer Services Ltd Dragon Division 10 Jerome Road Larkfield Kent ME20 6UR	*Utilities 1* *Disassembler*	£5 00 £5 00	8 8
Micro de-Bug Consultancy 60 Sir Johns Road Selly Park Birmingham B29 7ER	*Pro-File*	£8 95	6
Gem Software Unit D The Maltings Sawbridgeworth Herts	*Chateau*	£7 95	7
Cable Software PSL Marketing 52 Limbury Road Luton Beds	*Baccarat*	£8 75	3
Hornet Software 10 Buckingham s Way Sharnford Leics LE10 3PX	*Wormtube*	£8 00	5
Shards Software 189 Eton Road Ilford Essex IG1 2UG	*Empire*	£6 95	8
Microdeal 41 Truro Road St Austell Cornwall PL25 5JE	*Frogger* *Dragon Composer*	£8 00 £15 00	9 10

A routine matter

Andy Wilson looks at machine code routines on the ZX81 in the second of a three-part series

I now intend to discuss the machine code routines themselves If you feel you do not understand machine code, do not be deterred Reading on will give you a much clearer idea of now the routines can and cannot, be used The code makes extensive use of the ZX81 systems variables, but if you are conversant with Z80 assembly language, it should be possible to convert the routines for use on the Spectrum

The full assembly language listing is given in listing 6 This was produced using the Artic assembler and, if you own, or have access to one, the code can be entered directly One thing to note if you are using a different assembler, is that Artic always puts *Jp 7A3C* at the end of the program This has been replaced with 3 *Nops* in the hex-dump in order to keep the line number addresses the same

I will refer to the routines by the labels used in the assembler listing starting with *Rept* This routine uses its own *Stak* to keep track of nested loops The spare systems variable at *16507* is used to *Point* to the low byte of the current *Stak* address Rather than pointing to the next free byte, as does the Z80 stack pointer it points to the current return address

It works by storing the address from the systems variable *Nxtln* on the *Stak* (ie the address of the next program line) If the *Stak* is full the error subroutine is called giving error code *R*

Until works by looking at the repeat flag, or *Rflag* which is *Poked* from Basic by the line *Poke Until* (condition) giving *1* or *0* If the condition is true *Rflag* will be *1* and we just *Return* to Basic after resetting the *Stak Pointer* If the condition is false we need to jump back to the appropriate *Repeat* statement We take the address from the top of the *Stak* and *Poke* it into the systems variable *Nxtln* Thus, when we return to Basic, the operating system is fooled into continuing from the line after *Repeat*

If the *Stak* is empty it means there is no outstanding *Repeat*, so we call *Error* with code *U* *Until* is called from Basic by *Rand Usr Check* following *Poke Until* (condition)

You will notice that the error codes used are all in the range *N* to *U* This is achieved by *Poking* a number between *16h* and *1Dh* into *Errnr*, which forces a halt when we return to Basic *Error* is called with the number in question in the *A* register We subtract from this *16h*, giving us a number between *0* and *7*

All of the error messages are 16 characters long so multiplying this number by 16 and adding the result to the address of the first message gives the address of the start of the message we are interested in. This message is downloaded on to the bottom line of the screen — then we *Return* to Basic forcing a halt as described earlier This routine could easily be adapted for use in other machine code programs

Defp is the routine used to "define" procedures A procedure that has been defined has the address of its first line stored in the variable used as the name This means that there is no limit to the amount of procedures it is possible to define

This part of the routine is simplicity itself It takes up one instruction *Ld Bc (Nxtln)* This is at the end of the routine and labelled *OK4* It just puts the address of the next program line into register pair *BC* and when the *Usr* routine is evaluated in the instruction *Let Name=Usr Defproc* this address is stored in *Name*

That's easy enough, but what does the rest of the routine do? The problem is when we encounter a procedure definition in Basic, we do not want to execute the whole procedure, just store the address and skip the rest We do this by searching for an *Endproc* instruction then jumping to the following line

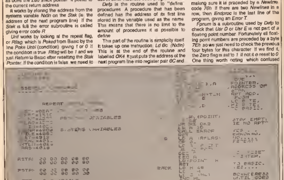
What the routine actually looks for is the pair of characters, *Usr E* It goes through the Basic program character by character, until it finds the next *Usr* It then looks to see if the next character is *D* or *E* If it is *D* it assumes this is a *Defproc* statement and gives *Error U* If it is *E*, we calculate the address of the next line (address of *E+Len Endproc +1*), and *Poke* this into *Nxtln* immediately before *Returning* to Basic

One problem was the floating point representation of numbers used by Sinclair It might be possible for one of these five-byte numbers to contain the codes for the character pairs we are looking for This is taken care of by *Calling* the subroutine *Fpnum* which will be described later

If we reach the beginning of the display file, ie *Dfile* without finding an *Endproc* it is obvious it has been left out and we call *Error* with code *Q*

In order to prevent any possibility of causing a system crash we check the address is really the start of a line by making sure it is preceded by a *Newline* code *76h* If there are two *Newlines* in a row, then *Endproc* is the last line of the program, giving an *Error T*

Fpnum is a subroutine used by *Defp* to check that *Usr D* or *Usr E* is not part of a floating point number Fortunately all floating point numbers are preceded by a byte *7Eh* so we just need to check the previous four bytes for this character If we find it, the Zero flag is set to *1* if not it is reset to *0* One thing worth noting which confused



me at first, is that *Djnz* does not set the Zero flag as you might expect.

Pcall — a slight departure from the order of the listing here — uses a *Stak* identical to that used in *Rept* to store the address of the next line, so we know where to return on completion of the procedure. Here we use another systems variable *Dest* to find the address of the variable containing the procedure address. Note that this should be in the variables area so if *Dest* is less than *Vars* the variable has not been previously defined (*Dest* will be the address of the *Name* in the *Callproc* statement).

Now comes the tricky bit. As you will remember, we carefully stored the procedure address in the variable *Name*. Unfortunately it is now in five-byte floating point form and converting this to an integer is not an easy process. The way I have chosen to do it is to transfer the number to the calculator stack, and then use the Rom routine *Unstk* to convert it back to an integer in *BC*.

First we need to save space on the calculator stack, using another Rom routine *Stkbc*. Note that it does not matter what is in *Bc*, as it will be overwritten anyway. We have already found *Dest*, which points to the byte before the number in the variables area. There is another systems variable *Stkend*, which points to the last byte of the number on the top of the calculator stack. We can now transfer the number to the stack by adding five to the value of *Dest* then using *Lddr*. It is now a simple matter to get the address we want into *BC*.

We now *Poke* this address into *Nxtln* and when we *Return* to Basic we jump to the first line of the procedure. Just in case we have inadvertently used the procedure name for some other purpose, we check the address is the start of a line as we did in the *Defp* routine.

Endp is a much simpler routine. The main part unstacks the address we stored in the *Pcall* routine, in the same way as we did in *Until*, then *Pokes* it into *Nxtln*. If the *Stak* is empty, there is something wrong.

Normally, the only way Basic can encounter an *Endproc* statement is when the procedure is called, otherwise it is skipped by the *Defproc* statement. Therefore, if the procedure *Stak* is empty, we must have left out a *Defproc*: error P. ■

```
        ,PRINT ERROR MESSAGES

MESSG   NESTED DEFPROC   ',N
        PROC STACK FULL  ',O
        ENDPR W/O DEFPR  ',P
        'DEFPR W/O ENDPR ,Q
        REPEAT STAK FULL ,R
        'UNDEF PROC NAME ,S
        'NO NEXT LINE    ,T
        UNTIL W/O REPEAT",U
ERROR  LD(ERRNR),A
       SUB 16          ,A=0 TO 5.
       LD HL,MESSG
       LD D,00
       AND A
       RLA
       RLA
       RLA
       RLA             ,A=Ax16
       LD E,A
       ADD HL,DE       ,HL=START
       PUSH HL         ,OF MESSAGE
       LD HL,(DFILE)
       LD DE,0300      ,FIND LAST
       ADD HL,DE       ,LINE OF
       EX DE,HL        ,SCREEN.
       POP HL
       LD BC,0010      ,PRINT ERR
       LDIR            ,MESSAGE.
       RET

        ,'PROCEDURE' PROGRAM

LEFP    LD HL,(NXTLN)
SERCH   INC HL          ,LOOK FOR
        PUSH HL         ,ENDPROC.
        LD BC,(EFILE)
        AND A           ,END OF
        SBC HL,BC       ,PROGRAM
        POP HL
        JR C OK3
        LD A,19         ,YES....
        CALL ERROR      ,ERROR=Q.
        RET
OK3     LD A,(HL)       ,IS THIS
        CP D4           ,'USR '?
        JR NZ SERCH
        INC HL          ,YES....
        LD A,(HL)       ,IS NEXT
        CP 29           ,CHAR 'D'?
        JR NZ NOTD
        CALL FPNUM      ,FP NUM?
        JR Z SERCH
        LD A,16         ,IT IS D.
        CALL ERROR      ,ERROR=N
        RET
NOTD    CP 2A           ,IS IT 'E'?
        JR NZ SERCH
        CALL FPNUM      ,FP NUM?
        JR Z SERCH
        LD BC,0005      ,ADDRESS OF
        ADD HL,BC       ,NEXT LINE.
        LD A,(HL)
        CP 76           ,IS THERE A
        JR Z NOLIN      ,NEXT LINE?
        DEC HL
        LD A,(HL)       ,CHECK THIS
        INC HL          ,IS START
        CP 76           ,OF A LINE.
        JR Z OK4
NOLIN   LD A,1C         ,NO.....
        CALL ERROR      ,ERROR=T
        RET
OK4     LD BC,(NXTLN)   ,YES....
        LD(NXTLN),HL    ,GO THERE.
        RET

FPNUM   PUSH HL
        DEC HL          ,SEE IF IT
        LD B,04         ,IS PART
NONUM   DEC HL          ,OF A
        LD A,(HL)       ,FLOATING
        CP 7E           ,POINT
        JR Z NUM        ,NUMBER.
        DJNZ NONUM
NUM     POP HL
        RET
ENDP    LD A,(CPOIN)
        CP 8C           ,CHECK STAK
        JR NZ OK5       ,NOT EMPTY.
        LD A,18
        CALL ERROR      ,ERROR=P.
        RET
OK5     LD H,40         ,TOP OF
        LD L,A          ,PSTAK.
        LD E,(HL)
        INC HL          ,'POP'
        LD D,(HL)       ,CALLING
        LD(NXTLN),DE    ,ADDRESS.
        DEC A
        DEC A           ,RESET
        LD(CPOIN),A     ,POINTER.
        RET

PCALL   CALL STKBC
        LD HL,(DEST)
        PUSH HL
        LD DE,(VARS)    ,CHECK PROC
        AND A            PREVIOUSLY
        SBC HL,DE       ,DEFINED.
        POP HL
        JR C UNDEF
        LD DE,(STKND)   ,TRANSFER
        LD BC,0005      ,FP NUMBER
        ADD HL,BC        TO CALC
        DEC DE          ,STACK,THEN
        LDDR            ,INTO BC AS
        CALL UNSTK      ,INTEGER.
        LD A,B
        CP 00
        JR Z UNDEF
        LD H,B          ,CHECK THIS
        LD L,C          ,IS THE
        DEC HL          ,START OF A
        LD A,(HL)       ,LINE.
        CP 76
        JR Z OK6
UNDEF   LD B,00
        LD A 1B
        CALL ERROR      ,ERROR=S.
        RET
OK6     LD DE,(NXTLN)
        LD A,(CPOIN)
        CP 96           ,STAK FULL?
        JR NZ OK7
        LD A,17
        CALL ERROR      ,ERROR=O
        RET
OK7     INC A
        INC A            MOVE STAK
        LD(CPOIN),A     ,POINTER
        LD H,40
        LD L,A
        LD(HL),E        ,'PUSH
        INC HL          ,CALLING
        LD(HL),D        ,ADDRESS.
        LD(NXTLN),BC    ,GOTO PROC.
        RET
```

A basic concept

Trevor Tome continues his six-part series on machine code

In the next two weeks we'll be looking at the way in which a Basic programmer can 'translate' concepts into machine code. This may not be entirely the best way of writing some routines but at least it gives the relative novice a chance to get going.

First of all, let's look at the machine code equivalent of variables. In Basic data can be stored for later use by means of the *Let* command

LET item = 27

In machine code you need to consider several aspects before you can write an equivalent command. First of all, there is no inherent way of storing numbers less than −32768 or greater than 65535. Similarly, there is no simple method of storing values which have fractions (eg *Let item = 1.5*). For mainly the second reason, most machine code routines are concerned with integer arithmetic and leave floating point calculations to Basic where it's much easier to control.

Now you need to decide the limits of the data item you are storing. If it never exceeds 255, you can use a single byte to store it, while larger values will need a word (16 bits, or two bytes) to hold the data. In most cases, you can play safe and always use 16 bits. Data areas can be reserved in assemblers by writing

ITEM DEFW 0 ; reserve one word

Some assemblers let you write

ITEM DEFS 2 ; reserve two bytes

but the second method does not initialise the data, it only reserves the space.

Now that you've got an area put aside you can save any of the Z80 register pairs by using the instruction

LD (ITEM),HL

where *Item* is the name of the data area reserved, and *HL* is the register pair whose current value is to be saved. *HL* can be replaced by *DE*, *BC*, *IX* or *IY*.

So the machine code equivalent of *LET item = 27* becomes

LD HL,27 ;put value 27 into HL
LD (ITEM),HL ;place HL contents into ITEM

In order to retrieve the contents of the data area, you write

LD HL,(ITEM)

which loads 27 (or whatever) back into *HL* (or *DE*, *BC*, *IX*, *IY*).

Simple stuff you might say, but how do I use this data item meaningfully? Let's now consider a small example of program which keeps a score, adding in 10 every time a key is pressed. The routine uses a couple of ROM routines, which I'll explain — see listing 1.

First of all, the routine sets data item *Score* to zero (*LD HL, 0* and *LD (Score),HL*). Within the main loop, it uses the ROM routine at address 15D4h to await a key press, but notice that before any I/O routines can be called, a program *must* select the appropriate device to be used. This is important if you intend to use the *RST 10h* output routine for printing — we'll cover this in a later article.

On exit from *Await$ Key*, the corresponding key code is left in register A. Next, the print position is moved to line 10, column 12 by using the ROM "string printing" routine. Notice how *DEFB* commands have been used to declare the *Print at* string. The routine now loads the current value of *Score*, adds 10 to it, then saves it again. Here, another ROM routine is used (at address 1A1Bh) to print the contents of register pair *BC* as a number on the screen. This routine will only handle values from 0-9999 since it is used to print the line numbers when a program is listed.

A check is now made to see if the *Break* key combination is being pressed, giving the user a chance to return to Basic. If not, the entire loop is started again.

I hope that some of the features of this program will have whetted your appetite — I will explore most of these and more in future articles.

So how about arrays? By reserving a

Listing 1

```
Addr Hex      Op   Operands        FF74*2A0000  LD   HL,(SCORE)
                                   FF77 110A00  LD   DE,10
FF58          AWAIT$KEY:           FF7A 19      ADD  HL,DE
FF58           EQU  15D4H          FF7B*220000  LD   (SCORE),HL
FF58          PRINT$NUM:           FF7E 44      LD   B,H
FF58           EQU  1A1BH          FF7F 4D      LD   C,L
FF58          BREAK$TST:           FF80 CD1B1A  CALL PRINT$NUM
FF58           EQU  1F54H          FF83 CD541F  CALL BREAK$TST
FF58          STR$PRINT:           FF86 38D6    JR   C,LOOP
FF58           EQU  203CH          FF88 C9      RET
FF58          SELDEV:              FF89         SCORE:
FF58           EQU  1601H          FF89 0000     DEFW 0
FF58          ENTRY$POINT          FF8B         ATLOC:
FF58 210000    LD   HL,0           FF8B 16       DEFB 22
FF5B*220000    LD   (SCORE),HL     FF8C 0A       DEFB 10
FF5E          LOOP:                FF8D 0C       DEFB 12
FF5E 3E01      LD   A,1
FF60 CD0116    CALL SELDEV         Symbols:
FF63 CDD415    CALL AWAIT$KEY      AWAIT$ 15D4    PRINT$ 1A1B
FF66 3E02      LD   A,2            BREAK$ 1F54    STR$PR 203C
FF68 CD0116    CALL SELDEV         SELDEV 1601    ENTRY$ FF58
FF6B*110000    LD   DE,ATLOC       LOOP   FF5E    SCORE  FF89
FF6E 010300    LD   BC,3           ATLOC  FF8B
FF71 CD3C20    CALL STR$PRINT      No error(s)
```

Listing 2

```
Addr Hex      Op   Operands        FF62 C9       RET
                                   FF63         GET$ITEM:
                                   FF63 2100F0   LD   HL,ARRAY$BASE
FF58          ARRAY$BASE:          FF66 19       ADD  HL,DE
FF58           EQU  0F000H         FF67 19       ADD  HL,DE
FF58          SET$ITEM             FF68 7E       LD   A,(HL)
FF58 E5        PUSH HL             FF69 23       INC  HL
FF59 2100F0    LD   HL,ARRAY$BASE  FF6A 66       LD   H,(HL)
FF5C 19        ADD  HL,DE          FF6B 6F       LD   L,A
FF5D 19        ADD  HL,DE          FF6C C9       RET
FF5E C1        POP  DE
FF5F 73        LD   (HL),E         Symbols:
FF60 23        INC  HL             ARRAY$ F000    SET$IT FF58
FF61 72        LD   (HL),D         GET$IT FF63
```

larger amount of memory — two bytes for every element of the array — you can set or get the value of any item in the array by using routines such as those shown in listing 2

The array base address should be preset (here I have used address 0F000h) and register pair *DE* is assumed to hold the element number required. The *Get* routine leaves the current value of this element in *HL*, while the *Set* routine places the value of *HL* into this element. Compare these

```
DIM z(20)           Z EQU 0F000H
LET z(2)=27         LD DE,2
                    LD HL,27
                    CALL SET$ITEM
LET score=z(13)     LD DE,13
                    CALL GET$ITEM
                    LD (SCORE),HL
```

You can initialise an entire array by using a routine similar to that shown in listing 3. This example is a machine code equivalent to

```
10 DIM z(20)
20 FOR x=1 TO 20
30 LET z(x)=x
40 NEXT x
```

A luxury of Basic is that any attempt to use an array element which is 'out of bounds' results in an error report 3. This does not occur in machine code unless you specifically write in checks that no item number is out of range — a rather arduous task — so there are probably going to be many occasions when your program will suddenly give spurious values for array data. In these circumstances you should check to see if the element values have gone out of bounds.

Next week I'll show how you can evaluate expressions such as *Let x=3*b(4)+2* in machine code ■

Listing 3

```
Addr Hex      Op   Operands

FF58          ARRAY$BASE:
FF58           EQU  0F000H
FF58          ITEM$COUNT:
FF58           EQU  20
FF58          ENTRY$POINT:
FF58 2100F0    LD   HL,ARRAY$BASE
FF5B 110010    LD   DE,0
FF5E 0614      LD   B,ITEM$COUNT
FF60          INIT$LOOP:
FF60 73        LD   (HL),E
FF61 23        INC  HL
FF62 72        LD   (HL),D
FF63 23        INC  HL
FF64 13        INC  DE
FF65 10F9      DJNZ INIT$LOOP
FF67 C9        RET

Symbols:
ARRAY$ F000    ITEM$C 0014
ENTRY$ FF58    INIT$L FF60

No error(s)
```

A display of fireworks

***John Scriven and Patrick Hall** present a firework game in the second of a two-part series*

This program, *Firework* is also based on a simple idea — offering examples of the four rules (add subtract, multiply and divide) The incentive to do well here is the impressive display after five correct answers.

Each of the graphic routines is held in a procedure and may be adapted to your own use or copied directly into a different program

The names given to the procedures should make the supervisor between lines 30-150 self-explanatory After *Procgraphics* and *Procinit* the *Repeat-Until* loops uses *Procsetup* to draw the rocket on the ground and *Procquestion* to test the child's arithmetic *Proclaunch* then makes the rocket rise up the screen until it is at the centre

Two tricks are used to create the impression that the rocket is continuing to travel upwards First, *Procascent* makes the ground appear to fall away beneath the rocket Then *Procmoon* moves the moon down the screen After that the actual firework display is created by *Procburst* The falling fragments of the rocket are shown moving down the screen and finally *Procfall* enhances the feeling of downward motion by moving the ground back up the screen

Notes

Procgraphics Characters 224-239 are redefined by this procedure Large plus, minus and divide signs are created by 224-226 (x, or *Chr$ 88*, is used for the multiplication sign) The rocket's nose and body are built up from *Chr$ 227* and *228* while *Chr$ 229* and *230* make the fuse Characters 231-233 form the rocket's exhaust flame and 234-237 are used to build up the composite character moon$ at line 380

Finally *Chr$ 238* is used to form the character bomb$, which like moon$ includes *Chr$ 32* to erase its path automatically on the screen

Procinit Line 450 is included in case the child types in a value for the variable 'answer' in *Procquestion* which causes the program to crash The inclusion of such a line in any initialisation procedure will make a program far less prone to unexpected behaviour from the child using it! Array space is set up for the *x* and *y* co-ordinates of the bombs in *Procburst* by line 460 The procedure also switches off the auto-repeat and defines a suitable envelope for the sound effect of the stars when the rocket explodes

Procsetup Here the initial screen display is created with the rocket waiting on the ground with its fuse smouldering Lines 520-560 select colours and set the flash rate for colour 10 which is used for the flickering end of the fuse The ground is drawn by using *Vdu 28* and *Cls* at lines *580 590* The rocket is drawn by printing *Chr$ 227* and *228* in colour 2 and the *Fornext* loop between lines 650-670 draws the fuse Finally, line 690 lights the end of the fuse with colour 3

Procquestion All the text which appears on the screen is confined to a window set up by using *Vdu 28* at line 730 Note how 760 and subsequent lines, include single apostrophes to space out neatly everything which is printed in the window Line 770 delays the program with *Procpause* Here the variable *P* is used to adjust the length of the pause The questions given to the child are controlled by the *Repeat Until* loop between lines 780-970 It can be seen that the test continues indefinitely until the child has achieved five correct answers

Lines 800-840 choose at random whether the question will be addition, subtraction, etc, and also select suitable numbers for each The routine between 860-960 accepts answers from the child It can be seen, from the condition at line 950, that if the child types in an incorrect response the same question will be set again This happens three times before line 960 tells the child what his answer should have been Line 960 also rewards correct answers with *Procright*

Procpause Because different length delays are required by separate parts of the program the time taken to execute the empty *For-Next* loop at line 1030 is controlled by the value given to the variable *P* Of course the value of *P* does not always have to be stated before summoning *Procpause* but only when the delay required differs from the last value given to *P* Note that again *I* has to be declared as a local variable

Procright This rewards correct answers by first increasing the value of 'score at line 1070 and then shortening the fuse To do this the text window is restored to the whole screen by *Vdu 26* at line 1110 Line

```
 10 REM Firework - Pat Hall, July '83
 20
 30 MODE 5
 40 PROCgraphics
 50 PROCinit
 60 REPEAT
 70   PROCsetup
 80   PROCquestion
 90   PROClaunch
100   PROCascent
110   PROCmoon
120   PROCburst
130   PROCfall
140   UNTIL FALSE
150 END
160
170 DEF PROCgraphics
180 REM Signs
190 VDU 23, 224, &18, &18, &18, &FF,
    &FF, &18, &18, &18
200 VDU 23, 225, &0, &0, &0, &FF, &FF,
    &0, &0, &0
210 VDU 23, 226, &18, &18, &0, &FF,
    &0, &18, &18, &0
220 REM Nose
230 VDU 23, 227, &0, &0, &18, &18,
    &3C, &3C, &7E, &7E
240 REM Body
250 VDU 23, 228, &7E, &7E, &7E, &7E,
    &7E, &7E, &7C, &7E
260 REM Fuse
270 VDU 23, 229, &0, &0, &0, &0, &0,
    &0, &0, &FF
280 VDU 23, 230, &3, &6, &C, &18, &30,
    &60, &C0, &FF
290 REM Exhaust
300 VDU 23, 231, &10, &18, &1C, &1C,
    &38, &38, &18, &8
310 VDU 23, 232, &10, &18, &18, &1C,
    &3E, &3E, &77, &77
320 VDU 23, 233, &EE, &EE, &7C, &7C,
    &38, &18, &18, &8
330 REM Moon
340 VDU 23, 234, &1, &3, &F, &F, &1F,
    &1F, &3F, &3F
350 VDU 23, 235, &80, &C0, &F0, &F0,
    &F8, &F8, &FC, &FC
360 VDU 23, 236, &3F, &3F, &1F, &1F,
    &F, &F, &3, &1
370 VDU 23, 237, &FC, &FC, &F8, &F8,
    &F0, &F0, &C0, &80
380 moon$ = CHR$ 32 + CHR$ 32 +
    CHR$ 10 + CHR$ 8 + CHR$ 8 +
    CHR$ 234 + CHR$ 235 + CHR$ 10 +
```

1120 then overprints the end of the fuse with *Chr$ 230 + Chr$ 32* thus decreasing its length whilst still leaving its flickering end Line 1130 re-establishes the text window before the current score is printed as a prompt.

Proclaunch Before the rocket is launched the text window is completely removed by line 1200 The final part of the fuse is removed in 1220 Then the rocket's sound effect is switched on by line 1240 Motion up the screen is created by the *For Next* loop between lines 1260-1440 The rocket's nose is printed by line 1300 Its body is printed by lines 1330 and 1350 Each line is preceded by a conditional statement which adjusts the background colour to match ground or sky.

The rest of the loop deals with the rocket's exhaust Note that the colour of the exhaust is changed from green/magenta to black/white when it is no longer seen against the ground This is controlled by line 1380 Finally line 1450 increases the size of the rocket exhaust

Procascent The rocket never rises beyond mid-screen However, the illusion of further upwards travel is produced by the *For-Next* loop between lines 1500-1530 Here line 1510 successively removes whole lines of the ground in a way which simulates the view which would be seen from the rocket itself The final strip of ground is deleted by using the text window at lines 1540 1550

Procmoon Further animation is produced in this procedure by moving the composite character moon$ down the screen using the *For-Next* loop between lines 1610-1640 The final position of moon$ is erased by lines 1650 1660

Procburst Line 1720 explodes the rocket by turning off its sound and clearing the screen Lines 1730-1780 select suitable colours and sounds and immediately the two nested *For-Next* loops between lines 1800-1930 create the starburst explosion on the screen The co-ordinates chosen for *Print Tab* between 1830-1910 build up a large symmetrical pattern This display continues for six seconds and is then replaced by five randomly located bombs which burst on the screen at co-ordinates determined by the loop between 1950-1980 The nested *For-Next* loops between 2100-2150 let the bombs fall gently down the screen until line 2160 clears the display completely

Procfall This procedure is the reverse of *Procascent* The text window at line 2220 places the first strip of green ground at the bottom of the screen and then the *For-Next* loop from 2240-2270 builds up the rest in a way that suggests a gradual fall back to earth The intention is that the eye is following imaginary debris from the explosion Finally, exactly the same amount of green is present at the bottom of the screen as was there originally and the ground is ready for another rocket, and another five questions ■

This is an extract from Programming for Education on the BBC computer by John Scriven and Patrick Hall and published by Sunshine Books.

```
    CHR$ 8 + CHR$ 8 + CHR$ 236 +
    CHR$ 237
390 REM Bomb
400 VDU 23, 238, &18, &7E, &7E, &FF,
    &FF, &7E, &7E, &18
410 bomb$ = CHR$ 32 + CHR$ 10 +
    CHR$ 8 + CHR$ 238
420 ENDPROC
430
440 DEF PROCinit
450 ON ERROR RUN
460 DIM xcoord( 5 ) : DIM ycoord( 5 )
470 * FX 11, 0
480 ENVELOPE 1, 1, 2, 3, 4, 15, 20,
    15, 127, 0, 0, -1, 127, 127
490 ENDPROC
500
510 DEF PROCsetup
520 VDU 19, 1, 0, 0, 0, 0
530 VDU 19, 2, 4, 0, 0, 0
540 VDU 19, 3, 10, 0, 0, 0
550 * FX 9, 10
560 * FX 10, 10
570 REM Draw ground
580 VDU 28, 0, 31, 19, 20
590 COLOUR 129 : CLS : VDU 26
600 VDU 19, 1, 2, 0, 0, 0
610 REM Draw rocket on ground
620 COLOUR 2 : COLOUR 129
630 PRINT TAB( 10, 25 ); CHR$ 227
640 PRINT TAB( 10, 26 ) CHR$ 228
    TAB( 10, 27 ) CHR$ 228
650 FOR I = 11 TO 15
660   PRINT TAB( I, 27 ) CHR$ 229
670   NEXT I
680 COLOUR 3
690 PRINT TAB( 16, 27 ) CHR$ 230
700 ENDPROC
710
720 DEF PROCquestion
730 VDU 28, 4, 14, 15, 5
740 COLOUR 0 : COLOUR 130 : CLS
750 PRINT   " FIREWORKS!"
760 PRINT   " To launch"
     " the rocket"  " you must
     get five"   " correct"
     " answers."
770 * FX 15, 10 : PROCpause : score = 0
780 REPEAT
790   REM Select question
800   type = RND( 4 )
810   IF type = 1 THEN A = RND( 100 )
      : B = RND( 100 ) : C = A + B :
      sign$ = CHR$ 224
820   IF type = 2 THEN A = RND( 100 )
      : B = INT ( A * RND( 1 ) ) : C =
      A - B : sign$ = CHR$ 225
830   IF type = 3 THEN A = RND( 100 )
      : B = RND( 10 ) : C = A * B :
      sign$ = CHR$ 88
840   IF type = 4 THEN B = RND( 10 ) :
      A = B * RND( 100 ) : C = A / B :
      sign$ = CHR$ 226
850   REM Present question
860   try = 0
870   REPEAT
880     try = try + 1
890     PRINT   " What is"
900     PRINT TAB( 1 );A CHR$ 32 sign$
        CHR$ 32 B CHR$ 32 CHR$ 63
910     * FX 15, 0
920     INPUT TAB( 1 ), answer
930     IF answer = C THEN
        SOUND 1, -15, 150, 10 ELSE
        SOUND 1, -15, 100, 10
940     PROCpause
950     UNTIL answer = C OR try = 3
960   IF answer = C THEN PROCright
      ELSE PRINT ' " No,"; C
970   UNTIL score = 5
980 PRINT      " So we can"
    " CELEBRATE"
990 PROCpause
1000 ENDPROC
1010
1020 DEF PROCpause : LOCAL I
1030 FOR I = 1 TO P * 300 : NEXT I
1040 ENDPROC
```

Continued on page 27


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```
1050
1060 DEF PROCright
1070 score = score + 1
1080 PRINT ' " Well done" ' " The fuse"
     " is getting" ' " shorter !"
1090 PROCpause
1100 REM Shorten fuse
1110 VDU 26 : COLOUR 3 : COLOUR 129
1120 PRINT TAB( 16 - score, 27 )
     CHR$ 230 + CHR$ 32
1130 VDU 28, 4, 14, 15, 5
1140 COLOUR 0 : COLOUR 130 : CLS
1150 PRINT " You have"
1160 PRINT: CHR$ 32 score " right."
1170 ENDPROC
1180
1190 DEF PROClaunch
1200 COLOUR 128 : CLS : VDU 26
1210 COLOUR 129
1220 PRINT TAB( 11, 27 ) CHR$ 32
1230 REM Sound of rocket
1240 SOUND 0, -15, 6, -1
1250 REM Move rocket up screen
1260 FOR I = 25 TO 15 STEP - 1
1270   REM Rocket s nose
1280   COLOUR 2
1290   IF I < 20 THEN COLOUR 128 ELSE
       COLOUR 129
1300   PRINT TAB( 10, I ) CHR$ 227
1310   REM Rocket s body
1320   IF I < 19 THEN COLOUR 128 ELSE
       COLOUR 129
1330   PRINT TAB( 10, I + 1 ) CHR$ 228
1340   IF I < 18 THEN COLOUR 128 ELSE
       COLOUR 129
1350   PRINT TAB( 10, I + 2 ) CHR$ 228
1360   REM Rocket s exhaust
1370   COLOUR 3
1380   IF I < 17 THEN
       VDU 19, 3, 8, 0, 0, 0
1390   IF 1 < 17 THEN COLOUR 128 ELSE
       COLOUR 129
1400   PFINT TAB 10, I + 3 ) CHR$ 231
1410   IF 1  16 THEN COLOUR 128 ELSE
       COLOUR 129
1420   PRINT TAB( 10, I + 4 ) CHR$ 32
1430   P = 1 : PROCpause
1440   NEXT I
1450 PRINT TAB( 10, 18 ) CHR$ 232
     TAB( 10, 19 ) CHR$ 233
1460 ENOPPOC
1470
1480 DEF PROCascent
1490 COLOUR 128
1500 FOR 1 = 20 TO 29
1510   PRINT TAB( 0, I ): SFC ( 20 )
1520   PROCpause
1530   NEXT I
1540 VDU 28, 0, 31, 19, 29
1550 COLOUR 128 : CLS : VDU 26
1560 ENDPROC
1570
1580 DEF PROCmoon
1590 VDU 19, 1, 3, 0, 0, 0
1600 COLOUR 1
1610 FOR 1 = 0 TO 28
1620   PRINT TAB( 3, I )moon$ : VDU 30
1630   PROCpause
1640   NEXT I
1650 PRINT TAB( 3, 29 ) SPC ( 2 )
1660 PRINT TAB( 3, 30 ) SPC ( 2 )
1670 VDU 30
1680 ENDPROC
1690
1700 DEF PROCburst
1710 P = 10 : PROCpause
1720 CLS : SOUND 16, 0, 6, 1
1730 VDU 19, 1, 9, 0, 0, 0
1740 VDU 19, 2, 10, 0, 0, 0
1750 VDU 19, 3, 11, 0, 0, 0
1760 SOUND &201, 1, 100, 120
1770 SOUND &202, 1, 100, 120
1780 SOUND &203, 1, 100, 120
1790 REM Print starburst
1800 FOR I = 1 TO 20
1810   COLOUR RND( 3 )
1820   FOR J = 1 TO 9
1830     PRINT TAB( 10+J, 16 ) CHR$ 42
1840     PRINT TAB( 10-J, 16 ) CHR$ 42
1850     PRINT TAB( 10, 16+J ) CHR$ 42
1860     PRINT TAB( 10, 16-J ) CHR$ 42
1870     IF J  6 THEN 1920
1880     PRINT TAB( 10 + J, 16 + J )
         CHR$ 42
1890     PRINT TAB( 10 + J, 16 - J )
         CHR$ 42
1900     PRINT TAB( 10 - J, 16 + J )
         CHR$ 42
1910     PRINT TAB( 10 - J, 16 - J )
         CHR$ 42
1920     NEXT J
1930   NEXT I
1940 REM Select position for bombs
1950 FOR I = 1 TO 5
1960   xcoord( I ) = RND( 19 )
1970   ycoord( I ) = RND( 19 )
1980   NEXT I
1990 VDU 19, 2, 8, 0, 0, 0
2000 COLOUR 2 : CLS
2010 * FX 9, 5
2020 * FX 10, 15
2030 REM Explode bombs
2040 FOR I = 1 TO 5
2050   SOUND 0, -15, 6, 10
2060   PRINT TAB( xcoord(I), ycoord(I))
       bomb$
2070   F = 3 : PROCpause
2080   NEXT 1
2090 REM Move bombs downwards
2100 FOR I = 1 TO 10
2110   FOR J = 1 TO 5
2120     PRINT TAB( xcoord(J),
         ycoord(J) + I ) bomb$ : VDU 30
2130     NEXT J
2140   P = 1 : PROCpause
2150   NEXT 1
2160 CLS
2170 ENDPROC
2190 DEF PROCfall
2200 P = 2 : PROCpause
2210 VDU 19, 1, 2, 0, 0, 0
2220 VDU 28, 0, 31, 19, 29
2230 COLOUR 129 : CLS : VDU 26
2240 FOR I = 29 TO 20 STEP -1
2250   PRINT TAB( 0, I ) SPC ( 20 )
2260   PROCpause
2270   NEXT I
2280 ENDPROC
```

Another brick in the wall

Les Allan presents his own version of the classic arcade game Breakout

Breakout for the Commodore 64 a revival of the classic arcade game employs user defined graphics to replace the character set and construct the walls Sprite graphics are used to create the title page and control the movement of the bat and ball.

Two machine code routines are used to construct each of the two walls one for the title page and the other for the walls used in the game itself Movement of the bat and ball is also by machine code.

You are given four balls with which you have to dislodge bricks from the wall by repeatedly hitting the ball with your bat Points are given for each section of the wall that is destroyed and an extra ball is awarded for each wall that is broken through

A score table routine is provided at the end of each game which lists the ten top scores against their names

Variables

A	read data
J	value returned by joystick
T	general purpose
X	ball x
Y	ball y
Z	pointer for score table position
BA	balls left
BX	bat x
BY	bat y
BZ	sprite to character conversion
DX	ball increment x
DY	ball increment y

Continued on page 33

```
 Address       | Machine    | Assembly Code
Decml  Hex     | Code       | Program
49152  C000    | A9 02      |  LDAIM      2
49154  C002    | 8D 84 03   |  STA      900
49157  C005    | A2 FA      |  LDXIM    250
49159  C007    | A0 00      |  LDYIM      0
49161  C009    | 9D FF D7   |  STAX   55295
49164  C00C    | 9D F9 D8   |  STAX   55545
49167  C00F    | 9D F3 D9   |  STAX   55795
49170  C012    | 9D ED DA   |  STAX   56045
49173  C015    | 98         |  TYA
49174  C016    | 9D FF 03   |  STAX    1023
49177  C019    | 9D F9 04   |  STAX    1273
49180  C01C    | 9D F3 05   |  STAX    1523
49183  C01F    | 9D ED 06   |  STAX    1773
49186  C022    | AD 84 03   |  LDA      900
49189  C025    | CA         |  DEX
49190  C026    | F0 03      |  BEQ        3
49192  C028    | 4C 09 C0   |  JMP    49161
49195  C02B    | A9 20      |  LDAIM     32
49197  C02D    | A2 24      |  LDXIM     36
49139  C02F    | 9D B9 05   |  STAX    1465
49202  C032    | 9D E1 05   |  STAX    1505
49205  C035    | 9D 09 06   |  STAX    1545
49208  C038    | 9D 31 06   |  STAX    1585
49211  C03B    | 9D 59 06   |  STAX    1625
49214  C03E    | 9D 81 06   |  STAX    1665
49217  C041    | 9D A9 06   |  STAX    1705
49220  C044    | 9D D1 06   |  STAX    1745
49223  C047    | 9D F9 06   |  STAX    1785
49226  C04A    | 9D 21 07   |  STAX    1825
49229  C04D    | 9D 49 07   |  STAX    1865
49232  C050    | 9D 71 07   |  STAX    1905
49235  C053    | CA         |  DEX
49236  C054    | F0 03      |  BEQ        3
49238  C056    | 4C 2F C0   |  JMP    49199
49241  C059    | 60         |  RTS
49242  C05A    | A2 50      |  LDXIM     80
49244  C05C    | A9 00      |  LDAIM      0
49246  C05E    | 9D FF 03   |  STAX    1023
49249  C061    | 9D 4F 04   |  STAX    1103
49252  C064    | 9D 9F 04   |  STAX    1183
49255  C067    | 9D EF 04   |  STAX    1263
49258  C06A    | A9 02      |  LDAIM      2
49260  C06C    | 9D FF D7   |  STAX   55295
49263  C06F    | A9 04      |  LDAIM      4
49265  C071    | 9D 4F D8   |  STAX   55375
49268  C074    | A9 06      |  LDAIM      6
49270  C076    | 9D 9F D8   |  STAX   55455
49273  C079    | A9 08      |  LDAIM      8
49275  C07B    | 9D EF D8   |  STAX   55535
49278  C07E    | CA         |  DEX
49279  C07F    | F0 03      |  BEQ        3
49281  C081    | 4C 5C C0   |  JMP    49244
49284  C084    | A2 28      |  LDXIM     40
49286  C086    | A9 A0      |  LDAIM    160
49288  C088    | 9D 8F 07   |  STAX    1963
49291  C08B    | A9 0E      |  LDAIM     14
49293  C08D    | 9D 9F DB   |  STAX   56255
49296  C090    | CA         |  DEX
49297  C091    | F0 03      |  BEQ        3
49299  C093    | 4C 86 C0   |  JMP    49286
49302  C096    | 60         |  RTS
49303  C097    | AD 85 03   |  LDA      901
49306  C09A    | 8D 00 D0   |  STA    53248
49309  C09D    | AD 86 03   |  LDA      902
49312  C0A0    | 8D 01 D0   |  STA    53249
49315  C0A3    | AD 87 03   |  LDA      903
49318  C0A6    | 8D 02 D0   |  STA    53250
49321  C0A9    | AD 88 03   |  LDA      904
49324  C0AC    | 8D 10 D0   |  STA    53264
49327  C0AF    | 60         |  RTS
```

RP repeat counter
SC current score
SU SUM of data used in error trap routine
VC video chip start address
A$ home-crs dwn 25 times
SC$ score store name

Notes

14 clear screen dimension arrays
16 video chip start address screen black
18 generate A$ (simulate PRINT AT)
20 generate strings for score table
22 screen message during data transfer
24 clear sound chip
26 volume to maximum
28 set up waveform and note for voice 1
30 set up waveform and note for voice 3
36 reserve memory
38 turn off keyscan interrupt timer
40 switch in character
42 load complete character set from ROM to RAM
46 switch in I/O
48 restart keyscan interrupt timer
52 clear variables
54 read line of Z
58 read line 0-9
60 define BREAKOUT bat and ball
74 set up machine code routine
76 error trap checks for correct data entry
82 set character pointer to 14336 extended background to light blue title page machine code routine
84 88 text for title page
92 expand sprites in x and y
94-108 define shape location and colour of sprite
110 switch in sprites 1 to 8
112 print in author's name
114 clear variables
116-122 switch in extended background (part 2)
124-128 start game if joystick used or recycle title
130 sprites to standard size
136 clear screen set variables
142 machine code routine to set screen for game
148 define start of bat and ball
150-152 print balls left and score
154 start position and ball colour
156 start position and ball colour
160 clear msb of screen and sprite to character detection sprites 1 and 2 on
164 ball increment
166 reverse direction if outside range
168-170 bat increment
172 clear sound chip
174 locate bat and ball position in RAM
176 machine code routine to move bat and ball
178 check for bat and ball hit turn on voice 3
180 check for bat and ball miss
182 check for balls left
184 check for BREAKOUT
186 check for ball to wall hit
188 cal character location of sprite and error trap routine for space
190 demolish wall
192 if ball on way up then reverse direction
194 turn on voice 1
196 print score clear sprite to character selection
198 return to start of sequence
200 clear screen colour cyan
206 turn off sprites 1 and 2
208-210 check position for current score
212 clear keyboard buffer
214-218 input for player's name
220 reduce length to 11 if greater than 11
222-224 reduce length to ball character
226 if score less than lowest then print score table
228 rearrange score table position
234 enter current score to store
240-249 print score table
250 clear variables
252-254 flash joystick
256 check for joystick
258 repeat flash sequence if no joystick or less than 50 repeats
260 screen black goto title page
268-514 data for character set and sprites
520-564 data for machine code

Machine code routine

49152 load accumulator with red (2)
49154 store contents of accumulator in 900
49157 load x with 250
49158 load y with brick (0)
49161 store red with x increment starting 55296
49164 store red with x increment starting 55546
49167 store red with x increment starting 55796
49170 store red with x increment starting 56045
49173 transfer brick to accumulator
49174 store brick with x increment starting 1023
49177 store brick with x increment starting 1273
49180 store brick with x increment starting 1523
49183 store brick with x increment starting 1773
49186 load accumulator with contents of 900
49188 decrement x register by 1
49189 branch forward 3 if 0
49192 return to 49161 until screen full
49195 load accumulator with space (32)
49197 load x with 50
49199 store space with x increment starting 1465
49202 store space with x increment starting 1505
49205 store space with x increment starting 1545
49208 store space with x increment starting 1585
49211 store space with x increment starting 1525
49214 store space with x increment starting 1665
49217 store space with x increment starting 1705
49220 store space with x increment starting 1745
49223 store space with x increment starting 1785
49226 store space with x increment starting 1825
49229 store space with x increment starting 1865
49232 store space with x increment starting 1905
49235 decrement x register by 1
49236 branch forward 3 if 0
49238 return to 49199 until complete
49241 return to basic program
49242 load x with 50
49244 load accumulator with brick (9)
49246 store brick with x increment starting 1023
49249 store brick with x increment starting 1193
49252 store brick with x increment starting 1183
49255 store brick with x increment starting 1263
49258 load accumulator with red (2)
49260 store red with x increment starting 55896
49263 load accumulator with purple (4)
49265 store purple with x increment starting 55375
49268 load accumulator with blue (6)
49270 store blue with x increment starting 55455
49273 load accumulator with orange (8)
49275 store orange with x increment starting 55535
49278 decrement x register
49279 branch forward 3 if 0
49281 return to 49244 until complete
49284 load x with 40
49286 load accumulator with reverse space (160)
49288 store reverse space with x increment starting 1983
49291 load accumulator with light blue (14)
49293 store light blue with x increment starting 56255
49296 decrement x register
49297 branch forward 3 if 0
49299 return to 49286 until complete
49302 return to basic program
49303 load accumulator with ball x
49306 store ball x in VC
49309 load accumulator with ball y
49312 store ball y in VC+1
49315 load accumulator with bat x
49318 store bat x in VC+2
49321 load accumulator with sprite msb
49324 store msb in VC+21
49327 return to basic program ■

Please note that standard abbreviations for basic keywords must be used to satisfy some line lengths that would otherwise exceed a total of 80 characters. These appear on pages 130 and 131 of the Users Manual.

```
12 REM #### CLEAR SCREEN / SET INITIAL VARIABLES ####
14 PRINTCHR$(147):DIMSC(10):SC$(10)
16 VC=53248:POKEVC+32,0:POKEVC+33,0
18 FORT=1TO25:H$=H$+CHR$(17):NEXT:A$=CHR$(19)
   +A$:FORT=1TO10:SC(T)=0
20 SC$(T)=CHR$(154)+"  "+CHR$(158)+CHR$(18)+
   "64 BREAKOUT  "+CHR$(146)+CHR$(154)+
   "  ":NEXT
22 PRINTLEFT$(A$,13)SPC(8)CHR$(5)"SETTING UP
   CHARACTER SET"
24 FORT=0TO24:POKE54272+T,0:NEXT
26 POKE54296,15
28 POKE54276,32:POKE54277,24:POKE54278,40:POKE54273,
   8:POKE54272,147
30 POKE54290,16:POKE54291,136:POKE54292,
   129:POKE54287,8:POKE54286,147
32
34 REM #### PROTECT MEMORY - TRANSFER DATA
   FROM ROM TO RAM ####
36 POKE52,48:POKE56,48
38 POKE56334,PEEK(56334)AND254
40 POKE1,PEEK(1)AND251
42 FORT=0TO2048:POKE14336+T,PEEK(53248+T):NEXT
44 POKE1,PEEK(1)OR4
46 POKE56334,PEEK(56334)OR1
48
50 REM #### SET UP CHARACTERS ####
52 T=0:SUM=0
54 READA:IFA<>-1THENPOKE14336+T,A:T=T+1:SUM=SUM+A:GOTO54
56 T=0
58 READA:IFA<>-1THENPOKE14720+T,A:T=T+1:SUM=SUM+A:GOTO58
60
62 REM #### SET UP SPRITES ####
64 T=0
66 READA:IFA<>-1THENPOKE12800+T,A:T=T+1:SUM=SUM+A
   :GOTO66
70 REM #### SET UP MACHINE CODE ####
72 T=0
74 READA:IFA<>-1THENPOKE49152+T,A:T=T+1:SUM=SUM+A
   :GOTO74
76 IFSUM<>99433THENPRINTCHR$(147)CHR$(5)TAB(5)"
   ERROR IN DATA STATEMENTS   !!!":S
TOP
78
80 REM #### START GAME ####
82 POKEVC+24,(PEEK(VC+24)AND240)OR14:POKEVC+17,91
   :POKEVC+35,14:SYS49152
84 PRINTLEFT$(A$,14)SPC(6)CHR$(129)"YOU
   HAVE FOUR BALLS TO BREAK"
86 PRINTLEFT$(A$,15)SPC(6)"THROUGH AS MANY WALLS AS"
88 PRINTLEFT$(A$,16)SPC(16)"POSSIBLE"
90 PRINTLEFT$(A$,21)SPC(5)CHR$(156)"USE JOYSTICK
   "CHR$(31)"(PORT 2)"CHR$(156)" T
O START"
92 POKEVC+23,255:POKEVC+29,255
94 POKE2040,200:POKEVC,67:POKEVC+1,75:POKEVC+39,1
96 POKE2041,201:POKEVC+2,97:POKEVC+3,75:POKEVC+40,3
98 POKE2042,202:POKEVC+4,127:POKEVC+5,75:POKEVC+41,4
100 POKE2043,203:POKEVC+6,157:POKEVC+7,75:POKEVC+42,5
102 POKE2044,204:POKEVC+8,187:POKEVC+9,75:POKEVC+43,7
104 POKE2045,205:POKEVC+10,217:POKEVC+11,75:POKEVC+44,10
106 POKE2046,206:POKEVC+12,247:POKEVC+13,75:POKEVC+45,13
108 POKE2047,207:POKEVC+14,22:POKEVC+15,75:
    POKEVC+16,128:POKEVC+46,14
110 SUM=0:FORT=0TO7:SUM=SUM+2↑T:POKEVC+21,
    SUM:FORTT=1TO100:NEXTTT,T
```

Continued on page 35

```
112 PRINTLEFT$(A$,9)SPC [illegible]
    PRINTLEFT$(A$,10)SPC [illegible] "[illegible]"
114 T=0 RP=0
116 T=T+1 IFT=10THENPRINTLEFT$(A$,21)SPC
    (18)CHR$(18) CHR$(31)"[PORT 2]
118 IFT=20THENPRINTLEFT$(A$,21)SPC(18)CHR$([illegible]
    CHR$(31) [PORT 2]  RP=RP+1 T=0
120 J=PEEK(56320)
122 IFRP<10ANDJ=127THEN116
124 POKEVC+21 0
126 PRINTLEFT$(A$,5)SPC(32)CHR$(20)"[illegible]
    PRINTLEFT$(A$,10)SPC(32)[illegible]
128 IFJ=127 THEN110
130 POKEVC+23 0 POKEVC+29 0
132
134 REM **** SET UP GAME ****
    PRINTCHR$(147) BA=4 SC=0
    
    REM **** NEW WALL ****
    SYS49242
 44
    REM **** NEW BALL ****
    X=104 Y=159 DY=0 DX=0 [illegible]
    PRINTLEFT$(A$,25)SPC([illegible])CHR$( 1)
    CHR$(18)"BALLS LEFT BA
    PRINTSPC(3)"SCORE SC [illegible]
    POKE2040 209 POKEVC [illegible] POKEVC+1 [illegible] POKEVC+39 7
    POKE2041 208 POKEVC+2 [illegible] POKEVC+3 [illegible] POKEVC+40 6
 58 POKEVC+16 0 POKEVC+21 3 POKEVC+[illegible] 0
160
162 REM **** MOVE BAT & BALL ****
164 X=X+DX Y=Y+DY
166 IFX<24ORX>320THENDX=-DX
    IFPEEK(56320)=123ANDB[illegible]THENB=B-12
    IFPEEK(56320)=119ANDB[illegible]THENB=B+12
172 POKE54276 [illegible] POKE54296 15
174 POKE981[illegible]AND255 POKE982 [illegible] POKE983
    BXAND255 POKE984 INT([illegible]+INT(BY[illegible]
    SYS49380
    IFY=BYAND[illegible]THENDY=-DY POKE54290 17
    IFY>BYANDBA>0THENBA=BA-1 IFBA>0THEN146
    IFBA=0THENSC=4 PRINTLEFT$(A$,1[illegible]
    CHR$(5) "GAME OVER " FORT=1T0 2500 NE
    [illegible]4
    IFY<31THENDA=BA+1 GOTO142
    IF(PEEK(VC+31)AND1)<1THEN164
180 BZ=(X-24)/8+(Y-59)*5 IFPEEK(1024+BZ)=32THEN164
190 POKE1024+BZ,32 POKE1064+BZ,32
192 IFDY=0THENDY=-DY
194 POKE54276 33
196 SC=SC+1 PRINTLEFT$(A$,25)SPC([illegible] POKEVC+31 0
198 GOTO164
200
202 REM **** SCORE TABLE ****
204 PRINTCHR$(147) POKEVC+[illegible] POKEVC+23 0
206 POKEVC+21 0 POKEVC 0 POKEVC+1
    0 POKEVC+2 0 POKEVC+3 0
    Z=0 FORT=1TO10 IFSC>SC(T)THENZ=T T=11
  0 NEXT IFZ=0THEN240
  2 POKE198 0
 14 PRINTLEFT$(A$,[illegible])SPC(9)CHR$(154)
    ENTER TEXT FOR SCORE TABLE
216 PRINTLEFT$(A$,13)SPC(11)"NAME [illegible]
218 FORT=1TO12 PRINTCHR$(15[illegible] NEXT
    PRINTCHR$([illegible]) INPUTN$
220 IFLEN(N$)>11THENN$=LEFT$(N$,11)
222 FORT=1TO11 Z$=MID$(N$,T,1) IFZ$=CHR$(46)
    THENN$=LEFT$(N$,T-1) T=12
224 NEXT
226 IFZ=0THEN234
228 FORT=9TOZSTEP-1 SC(T+1)=SC(T) SC$(T+1)=SC$(T) NEXT
230
232 REM **** ENTER SCORE ****
234 SC(Z)=SC SC$(Z)=CHR$(2[illegible])+CHR$
    (2[illegible])+CHR$(18)+CHR$([illegible])+N$+CHR$(32)
236
238 REM **** PRINT SCORE TABLE ****
240 PRINTCHR$(147)TAB(12)CHR$(154)"**"CHR$(30)
    "SCORE TABLE"CHR$(154)"**"CHR$(1
7)
242 POKEVC+35 4 FORT=1TO10
244 PRINTCHR$(30)CHR$([illegible]) [illegible]ER",T,
    TAB(12)CHR$(5),SC(T)TAB(22)CHR$(158) SC$(T
) NEXT
246 PRINTLEFT$(A$,25)SPC(4)
248 PRINTCHR$(30)"USE "CHR$(5)"JOYSTICK"
    CHR$(30)" TO RESTART
250 T=0 RP=0
252 T=T+1 IFT=10THENPRINTLEFT$(A$,25)SPC
    (12)CHR$(18)CHR$(5)"JOYSTICK"CHR$(146)
254 IFT=20THENPRINTLEFT$(A$,25)SPC(12)
    CHR$(5)"JOYSTICK"  RP=RP+1 T=0
256 J=PEEK(56320)
258 IFJ=127ANDRP<50THEN252
260 POKEVC+32 0 POKEVC+33,0   T
```

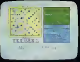
```
266 REM **** [illegible] ****
268 DATA231 231 231 [illegible] 126,0
270 DATA126 102,102,[illegible],230,0
272 DATA124 102,102 1[illegible],252,0
274 DATA126,102 96,96,[illegible] 254,0
276 DATA120 104 102,102,[illegible] 248 0
278 DATA126 96 96 120,224,[illegible] 254,0
280 DATA126 96 96,120,224,[illegible],224,0
282 DATA126 102 96,110,230,230,254,0
284 DATA102 102 102,126,230,230 230 0
286 DATA60 24,24,24,56,56,126,0
288 DATA60 24 24 24 28,220,252,0
290 DATA102 108,120 112 248 236 230 0
292 DATA96 96 96 96 224 230 254 0
294 DATA102,126 102 102 230 230 230 0
296 DATA102 118 126 118 230 230 230 0
298 DATA126 102 102 102 230 230 254 0
300 DATA126 102 102 126 224 224 224 0
302 DATA126 102 102 [illegible] [illegible] [illegible] [illegible] 0
304 DATA124 102 102 124 248 236 230,0
306 DATA60 102 96 126 6 230 252 0
308 DATA126 24 24 24 56 56 56 0
310 DATA102 102 102 102 230 230 252 0
312 DATA102 102 230 230 230 60 24 0
314 DATA102 102 102 102,230 254 238 0
316 DATA102 102 60 24 60 230 230 0
318 DATA102 102 102 60 24 56 56,0
320 DATA126 6 12 24 240 224 254 0
322 DATA-1
324 DATA126 102 102 102 230 230 254,0
326 DATA24 24,56 24 56 56 126 0
328 DATA60 102 6,12 48 110 126 0
330 DATA60 102 6 28 6,110 124 0
332 DATA6,102 102 102 12[illegible] 6,6 0
334 DATA126 96,124 6 6 230 252 0
336 DATA60,102 96 252 230 230 252 0
338 DATA126 102 12 24 56 56,56,0
340 DATA60 102 102 60 230 230 252,0
342 DATA60 102 102 62 6 118 124 0
344 DATA-1
346
348 REM **** SPRITE DATA FOR TITLE ****
350 DATA255 192 0 255 224 0 240 112
352 DATA0 240 112 0 240 112 0 240
354 DATA112 0 255 224 0 255 224 0
356 DATA240 112 0 240 112 0 240 112
358 DATA0 240 112 0 255 224 0 255
360 DATA192 0 0 0 0 0 0 0
362 DATA0 0,0 0 0 0 0 0
364 DATA0 0 0 0 0 0 0 0
366 DATA255 192 0 255 224 0 240 240
368 DATA0 240 112 0 247 112 0 240
370 DATA240 0 255 224 0 255 192 0
372 DATA255 0 0 255 128 0 247 192
374 DATA0 243 224 0 241,240,0 240
376 DATA240 0 0 0 0 0 0,0
378 DATA0 0 0 0 0 0 0 0
380 DATA0 0 0 0 0 0 0,0
382 DATA255 240 0 255 240 0 240 0
384 DATA0 240 0 0 240 0 0 240
386 DATA0 0 255 0 0 255 0 0
388 DATA240 0 0 240 0 0 240 0
390 DATA0 240 0 0 255 240 0 255
392 DATA240 0 0 0 0,0 0 0
394 DATA0 0 0 0 0 0 0
396 DATA0 0 0 0 0,0 0
398 DATA15 0 0 63,192 0 240 240
400 DATA0 240 240,0 240,240,0 240
402 DATA240 0 255 240 0 255 240 0
404 DATA240,240 0 240 240 0,240,240
406 DATA0 240,240 0 240,240 0,240
408 DATA240,0,0 0 0 0 0,0
410 DATA0 0 0 0 0 0 0 0
412 DATA0 0 0 0 0 0 0 0
414 DATA240 240 0 241 224 0 243 192
416 DATA0 247,128,0 255 0 0,255
418 DATA0 0 254 0,0 254 0,0
420 DATA255 0 0 255 0 0 255 128
422 DATA0 247 192,0,243 224 0 241
424 DATA240 0,0 0 0 0 0,0
426 DATA0 0 0 0 0 0 0 0
428 DATA0 0 0 0 0 0,0,0
430 DATA63 192 0 127 224 0 240 240
432 DATA0 240 240 0 240 240 0 240
434 DATA240 0 240 240 0 240 240 0
436 DATA240 240 0,240 240 0 240,240
438 DATA0 240 240 0 127 224 0,63
440 DATA192 0 0 0 0 0 0 0
442 DATA0 0 0 0 0 0 0 0
444 DATA0 0 0 0 0 0 0 0
446 DATA240 240 0 240,240 0 240 240
448 DATA0,240 240 0 240,240 0,240
450 DATA240,0,240,240,0,240 240 0
```

Continued over the page

```
452 DATA240 240 0 240 240,0?240,240
454 DATA0 240 240 0 127 224,0,[illegible]
456 DATA1[illegible],0 0 0 0 0 0 0
458 DATA0 0 0 0 0 0 0 0
460 DATA0 0 0 0 0 0 0 0
462 DATA255 240 0 255 240 0 15 0
464 DATA0 15 0 0 15 0 0 15
466 DATA0 0 15 0 0 15 0 0
468 DATA15 0 0 15 0 0 15 0
470 DATA0 15 0 0 15 0 0 15
472 DATA0 0 0 0 0 0 0 0
474 DATA0 0 0 0 0 0 0 0
476 DATA0 0 0 0 0 0 0 0
478
480 REM #### SPRITE DATA FOR BAT & BALL ####
482 DATA0 0 0 0 0 0 0 0
484 DATA0 0 0 0 0 0 0 0
486 DATA0 0,0 0 0 0 0 0
488 DATA0 0 0 0 0 0 0 0
490 DATA0 0 0 0 0 0 0 0
492 DATA0 0 0 0 0 0 0 0
494 DATA0 0 [illegible] 255 252 [illegible] 255
496 DATA252 [illegible] 255 252 [illegible] 255 252 0
498 DATA0 0 0 0 0 0 0 0
500 DATA0 0 0 0 0 0 0 0
502 DATA0 0 0 0 0 0 0 0
504 DATA0 0 0 0 0 0 0 0
506 DATA0 0 [illegible] 0 0 0
508 DATA12[illegible] 0 0 126 0 [illegible] 1[illegible]
510 DATA0 126 0 0 0 0 0 0
512 DATA0 0 0 0 0 0 0 0
514 DATA-1
516
518 REM #### MACHINE CODE DATA ####
520 DATA1[illegible]9 [illegible] 141 1[illegible]2 [illegible] 16[illegible] 250 160
522 DATA0 15[illegible] [illegible] 15 1[illegible] [illegible]49 21[illegible] 157
524 DATA243 [illegible] 15 [illegible] [illegible] 15[illegible] 157 255
526 DATA3 157,249,4,157,24[illegible],5,157
528 DATA237,6 173,132,3,20[illegible],240,6
530 DATA76,5,192,169,32,162,[illegible],157
532 DATA185,5,187,225,5,157,9,6
534 DATA157,49,6 157,89,6,157,129
536 DATA6,157,169,6,157,209,6,157
538 DATA249,6,157,33,7,157,73,7
540 DATA157,113,7 200,240,3,76,47
542 DATA192,[illegible],182,80,168,0,157,250
544 DATA3,157,73,4,157,159 4,157
546 DATA233,4,169,2,157,255,215,1[illegible]9
548 DATA4,157,73,216,169,0,157,159
550 DATA216,169 0,157 233,216,202 240
552 DATA3,76,32,192,162,40,169,160
554 DATA157,191,7,169,14,157,191,[illegible]19
556 DATA202 240,3,76,134,192,96
558 DATA173 133,3,141,0 208,173 134
560 DATA3 141,1,208,173 135,3,141
562 DATA2 208 1,3,136,3,141,16,208 9[illegible]
564 DATA-1
566
568
570 REM ########################
572 REM ########################
574 REM ####                ####
576 REM #### 64  BREAKOUT   ####
578 REM ####                ####
580 REM ####  COMMODORE 64  ####
582 REM ####                ####
584 REM ####  LES  ALLAN    ####
586 REM ####                ####
588 REM #### 9TH NOVEMBER   ####
590 REM ####                ####
592 REM ####      1983      ####
594 REM ####                ####
596 REM ########################
598 REM ########################
```



***Problem.** Simulating an aircraft on a small microcomputer and depicting the 3-D world outside through the eyes of the pilot.*

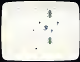


***Problem.** Turning the Spectrum's numerical abilities into powerful verbal skills combined with a huge vocabulary.*

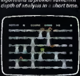
PSION HAVE BIG PROBLEMS.



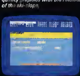
***Problem.** Evaluating complex algorithms to provide sufficient depth of analysis in a short time.*



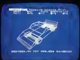
***Problem.** Integrating cartoon-quality graphics with the realism of the ski-slope.*



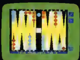
***Problem.** Creating cartoon-quality graphics in an entertaining and varied game.*



***Problem.** Providing complex, sophisticated data handling through easy-to-use commands.*



***Problem.** Modelling in 3-D on a small micro – performing some 7.5 million calculations for one hidden line drawing.*



***Problem.** Balancing the number of strategic factors required with a complex series of rules for a classic game.*

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- Flight Simulation (48K)
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- Space Raiders
- Planetoids
- VU-CALC
- VU-FILE
- VU-3D (48K)
- Hungry Horace
- Horace and The Spiders
- Horace Goes Skiing
- Backgammon
- Computer SCRABBLE® (48K)

Horace series produced in conjunction with Melbourne House. SCRABBLE® trademark and copyright licensed by Scrabble Schutzrechte und Handels GmbH – A J W Spear and Sons PLC subsidiary.

Whichever program you choose you can be sure it's high-quality and action-packed.

The popularity of our cassettes proves it. In a recent WH Smith chart of best-selling Spectrum software, no less than 7 of the top 12 were by Psion.

That means there's one good way to choose the best Spectrum software.

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PSION


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SWEET
TOMB



Once you've got to grips with the Rock 'n' Roll game, flip-over and get your teeth into Dracula.

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For only £6.95 you don't just get one top quality computer game, you get two.

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2 **Tomb Of Dracula** Darkness is falling. The vampires are hungry. You can't go back. Your only chance of survival lies ahead.
The walls are cold and clammy. With each step you remember the horrors ahead; ghouls, zombies and pits of choking slime. In your hand you have but seven silver stakes with which to defend yourself. Dare you face the ultimate evil, and win.

from — three suitable for the ZX Spectrum and two for the Commodore Vic 20 — and there are more to come.

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Twice the fun with two on one.



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Making a statement

***Chris Woods** presents a short machine code routine to abbreviate statement words*

A time-saving facility which is available on some computers is the ability to abbreviate statement words, eg *L* for *List*.

This short machine code routine makes it possible on the Dragon. The program uses the fact that every time the processor reads a statement, it jumps to location 377. This usually contains an RTS instruction so the processor returns to wherever it came from. Therefore, by changing the contents of location 377 we can make it jump anywhere in memory.

When it jumps to location 377, Accumulator A holds the code of the instruction it is reading, unless the instruction does not exist, in which case it holds the ASCII code of the first character in the word.

So, all we have to do is recognise the character code and change it to the code of the statement we want it to represent. (The instruction codes can be found in *PCW* Vol 2 No 42.)

The Basic loader program is in listing 1 and the assembly version is in listing 2. Listing 1 will, when typed in the Run, poke in the machine code and execute it. Once the machine code program has been executed the Basic program is no longer needed.

To use it, just type in the appropriate letter (see figure 1). In the case of instructions such as *Audio* where more than one word is needed, type the other word as normal, eg *A On (Audio On)*.

The abbreviations may be used in a program as well as direct commands. Listing 3 shows an example program. ■

Figure 1

A-AUDIO	H-CLS	O-OPEN	V-PRESET
B-PLAY	I-INPUT	P-PMODE	W-PCLS
C-CLEAR	J-CLOAD	Q-SOUND	X-SCREEN
D-DRAW	K-CSAVE	R-RUN	Y-PCLEAR
E-EDIT	L-LIST	S-SKIPF	Z-RETURN
F-FOR	M-MOTOR	T-TRON	
G-GET	N-NEXT	U-PSET	

Listing 1

```
10 CLEAR 200,31999
20 FOR A=32000 TO 32062:READ H$:H=VAL("&H"+H$):POKE A,H:T=T+H:NEXT A
30 IF T<>7809 THEN PRINT"DATA ERRORS":STOP
40 DATA 8E,7D,0C,BF,01,7A,86,7E,B7,01,79,39,81,5A,22,14,81,41,25,10,BE,00,A6,E6,
01,C1,CB,27,07,80,41,8E,7D,25,A6,86,39
50 DATA A3,B8,96,B5,A7,80,B3,A0,89,99,9A,95,A1,8B,9B,B7,A2,8F,A5,A8,AC,AD,AB,AE,
AF,91
```

Listing 2

```
7D00                      ORG
7D00 8E7D0C             40 @START LDX #@TEST   LOAD ADDRESS OF PROGRAM
7D03 BF017A             50      STX 378        & STORE AFTER JMP INSTRUCTION.
7D06 867E               60      LDA #126       STORE JMP
7D08 B70179             70      STA 377        INSTRUCTION.
7D0B 39                 80      RTS            RETURN TO BASIC.
7D0C 815A               90 @TEST CMPA #90      TEST
7D0E 2214              100      BHI @END       FOR
7D10 8141              110      CMPA #65       A
7D12 2510              120      BLO @END       LETTER.
7D14 BE00A6            130      LDX 166        CHECK
7D17 E601              140      LDB 1,X        THAT THERE
7D19 C1CB              150      CMPB #203      IS NOT AN =
7D1B 2707              160      BEQ @END       AFTER LETTER.
7D1D 8041              170      SUBA #65       CHANGE CHARACTER
7D1F 8E7D25            180      LDX #@DATA     CODE TO
7D22 A686              190      LDA A,X        INSTRUCTION CODE.
7D24 39                200 @END RTS            RETURN TO BASIC.
7D25 A3B896B5A780B3A0  210 @DATA FCB 163,184,150,181,167,128,179,160
7D2D 89999A95A18B9BB7  220      FCB 137,153,154,149,161,139,155,183
7D35 A28FA5A8ACADABAE  230      FCB 162,143,165,168,172,173,171,174
7D3D AF91              240      FCB 175,145
7D3F                   250      END @START
```

Listing 3

```
10 I "FREQENCY";F
20 IF F>255 THEN PRINT"IT MUST BE LESS THAN 255":GOTO 10
30 F K=1 TO 10:Q F,1:N K
40 R
```

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £8 for each program published.

Forest Race

on Spectrum

In this game you must steer your way down a road through a forest. The screen scrolls upwards as the game progresses and the road gets thinner making the game harder.

If you lose three lives the inevitable funeral march plays. This game is compatible with the Kempston Joystick.

Program notes

0-999	Main program
2000-2499	Prints next line of trees, road scrolls one line
2500	Crash routine
5000-5040	Lost routine
6000-6040	You won.
9000-9950	Data lines
9500-9690	Sets up the graphics
9998-9999	Save and verify

Variables

Lives =	Number of lives left.
Score =	Score
d =	No of places for car to be printed along top
e =	No of places along road to be printed
a$ =	Graphic of car

PROGRAM OF THE WEEK

```
   0>REM Peter Brown,
   1 REM 8,Hendham Close,Norwich
   2 REM "Forest Race" 23/7/83
   3 REM Compatable with Kempton
 joystick.
grapics a=♣ b=Z c=M d=M
   4 RESTORE 9000  GO SUB 9500
   5 LET lives=3  LET score=0
   6 POKE 23692,255
   8 LET d=10  LET a$="Z"
  10 BORDER 0  INK 7  PAPER 0  C
LS
  20 PLOT 0,0  DRAW 255,0  DRAW
0,175  DRAW -255,0  DRAW 0,-175
  23 LET p$="FOREST TRACK"
  24 FOR a=LEN p$ TO 1 STEP -1
  25 FOR l=1 TO 8+a  PRINT AT 10
,l, INK 2," ", PAPER 6, FLASH 1,
p$(a)  BEEP .01,0  NEXT l
  26 IF INKEY$<>"" OR IN 31=16 T
HEN PRINT AT 10,10, FLASH 1, INK
 6, PAPER 2,"FOREST TRACK"  GO T
O 30
  27 NEXT a  PRINT AT 20,1; INK
0, PAPER 6,"Writer and designer
- P.Brown."  FOR z=0 TO 2  FOR m
=0 TO 12 STEP .8  BEEP .01,m  NE
XT m  NEXT z
  28 PRINT AT 18,1, INK 8, INVER
SE 1,"""9"" to go left,""0"" to
go right"  PRINT AT 19,1, INK 3,
 INVERSE 1,"Compatable with Kemp
ston stick"
  29 PAUSE 50  BEEP .5,0  PAUSE
2  BEEP .5,0  PAUSE 2  BEEP .25,
3  BEEP .25,3  BEEP .25,2  BEEP
.25,0  BEEP .7,2  BEEP .3,-2  BE
EP .3,-5
  30 PRINT #1, FLASH 1,"      Ple
ase press any key.  "
  31 IF INKEY$<>"" THEN GO TO 31
  32 IF IN 31=16 THEN GO TO 31
  40 IF IN 31=16 THEN GO TO 50
  45 IF INKEY$="" THEN GO TO 40
  50 BORDER 3  PAPER 1  INK 5  C
LS
  60 INK 7  PLOT 0,0  DRAW 255,0
  DRAW 0,175  DRAW -255,0  DRAW
0,-175
  70 INK 4
  80 FOR z=0 TO 200  NEXT z
 100 POKE 23692,255
 105 LET score=score+5
 110 REM BEEP 6/2000,-1
 112 PAPER 0
 115 GO SUB 2000
 117 IF INKEY$="" THEN LET a$="Z
"
 118 IF IN 31=0 THEN LET a$="Z"
 120 IF INKEY$="9" THEN LET d=d-
1  LET a$="M"  IF d<0 THEN LET d
=0
 125 IF IN 31=2 THEN LET d=d-1
LET a$="M"  IF d<0 THEN LET d=0
 130 IF INKEY$="0" THEN LET d=d+
1  LET a$="M"  IF d>31 THEN LET
d=31
 134 IF IN 31=1 THEN LET d=d+1
LET a$="M"  IF d>31 THEN LET d=3
1
 138 PAPER 0
 139 INK 2
 140 IF ATTR (0,d)=12 THEN GO SU
B 3000  GO TO 100
 142 PRINT AT 0,d, INK 6,a$
 143 BEEP .01,-20
 148 PAPER 1
 999 GO TO 100
1117 IF INKEY$="" THEN LET a$="Z
"
2000 PAPER 1  INK 4  PRINT AT 21
,0,"♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣♣
♣♣♣♣"
2010 READ a
2015 IF a=998 THEN RESTORE 9000
 GO TO 2010
2018 PAPER 0
2019 IF score=3000 THEN GO TO 60
00
2020 IF score>2000 AND score<300
0 THEN PRINT AT 21,a,"  "
2021 IF score>1000 AND score<=20
00 THEN PRINT AT 21,a,"   "
2022 IF score>0 AND score<=1000
THEN PRINT AT 21,a,"    "
2028 PAPER 1
2030 PRINT ,
2499 RETURN
2500 PAUSE 0
3000 FOR n=0 TO 21  PRINT AT n,0
, OVER 1, FLASH 0, [redacted]  PRINT AT 0
,d, INK RND*7, ...1, OVER 0,
INVERSE 1, ...
3001 PRINT AT 0,d, INK 2, PAPER
5, INVERSE 1, FLASH 1,"Z"
3003 NEXT n
3005 FOR n=0 TO -50 STEP -1  BEE
P .01,n  NEXT n
3010 PRINT AT 10,10, INVERSE 1,
FLASH 1, PAPER 7, INK 3,"  You
Crashed!"
3020 FOR z=0 TO 200  NEXT z
3030 LET lives=lives-1
3035 IF lives=0 THEN GO TO 5000
3040 BORDER 3
3050 CLS
3499 RETURN
5000 PAPER 0  INK 7  BORDER 0  C
LS
5010 PRINT AT 10,0, INK 2,"I'm a
fraid that you have crashedonce
too often, you have gone tothe g
reat scrap-heap in the sky,with
a score of  -", FLASH 1, INK 5,s
core
5015 BEEP 1,0  PAUSE 2  BEEP 1,0
  PAUSE 2  BEEP .2,0  PAUSE 2  B
EEP .8,0  BEEP .5,3  BEEP .5,2
BEEP .5,2  BEEP .5,0  BEEP .7,0
 BEEP .3,-1  BEEP 1,0
5020 PRINT #1, FLASH 1, PAPER 2,
"PRESS  ANY  KEY  TO  PLAY  AGAI
N"
5026 IF IN 31=16 THEN GO TO 5040
5030 IF INKEY$="" THEN GO TO 502
5
5040 GO TO 5
6000 PAPER 3  INK 7  BORDER 3
6010 PRINT AT 10,0, FLASH 1,"You
  have  compleated the coursewel
l done you're a good driver .",
INK 7, PAPER 4,"Score for this g
ame was -       ",AT 12,27,score
6013 FOR n=0 TO 2  FOR z=0 TO 12
 STEP .5  BEEP .01,2  NEXT z  NE
```



```
XT n
5020 PRINT 01, INK 2, PAPER 0, F
LASH 1,"PRESS  ANY  KEY  TO  PLA
Y  AGAIN"
5025 IF IN 31=16 THEN GO TO 5040
5030 IF INKEY$="" THEN GO TO 502
5
5040 GO TO 1
8000 DATA 16,56,124,56,124,254,1
3,16
8010 DATA 66,126,90,24,24,90,102
,90
8020 DATA 0,231,66,190,190,66,23
1,0
8030 DATA 0,231,66,126,126,66,23
1,0
9000 DATA 10,10,10,11,12,13,14,1
5,16,17,16,19,20,20,20,20,20,19,
18,17,16,17,18,18,18,19,20,19,18
,17,16,16,14,13,12,11,10,9,8,7,6
,5,4,3,2,1,1,1,2,3,4,5,6,7
9010 DATA 7,7,6,5,4,3,4,5,6,7,8,
9,10,11,12,13,14,16,16,17,18,19,
20,19,19,18,17,16,15,16,16,17,18
,16,14,13,12,11,12,13,14,16,16,1
4,13,12,11
9020 DATA 10,16,10,11,12,13,14,1
5,16,17,16,19,20,20,20,20,20,19,
18,17,18,17,18,18,18,19,20,19,18
,17,16,16,14,13,12,11,10,9,8,7,6
,5,4,3,2,1,1,1,2,3,4,5,6,7
9030 DATA 7,7,6,5,4,3,4,5,6,7,8,
9,10,11,12,13,14,15,16,17,18,19,
20,19,19,18,17,16,15,16,18,17,18
,16,14,13,12,11,12,13,14,16,16,1
4,13,12,11
9050 DATA 999
9080 BEEP .5,0: PAUSE 2: BEEP .5
,0  PAUSE 2  BEEP .25,0  BEEP .2
5,3  BEEP .25,2  BEEP .25,0  BEE
P .7,2  BEEP .3,-2  BEEP .5,-5
9500 FOR n=0 TO 7: READ f  POKE
USR "a"+n,f  NEXT n
9510 FOR n=0 TO 7: READ f  POKE
USR "b"+n,f  NEXT n
9520 FOR n=0 TO 7  READ f  POKE
USR "c"+n,f  NEXT n
9530 FOR n=0 TO 7: READ f  POKE
USR "d"+n,f  NEXT n
9990 RETURN
9994 BORDER 0  PAPER 0  INK 7  C
LS  PRINT AT 20,0,"Place tape i
n tape recorder, andcheck that '
ear' is disconnected"
9995 SAVE "race" LINE 1
9996 CLS  PRINT AT 10,0,"Rewind
 tape and play to verify.."
9997 VERIFY ""
9998 BEEP 2,0
9999 PRINT AT 10,0, FLASH 1,"
     Tape Verified.         "
PAUSE 250  RUN
```

Forest Race
by Peter Brown

Planat Invader

on Vic20

Yet another invader game This one uses user defined graphics One of the invaders will require two hits to be destroyed Each one you kill will be replaced by a faster one Use space bar to fire

Program notes

1-6	Set up characters
10-15	Set up screen
19-24	Move invader check for fire
40-43	Explode alien
50	Explodes missile
60	Sets variables
80	Game over

```
1 PRINT"":POKE56,28:POKE36869,255:RESTORE
2 READA:IFA=999THEN10
3 POKE7424+B,A:B=B+1:GOTO2
4 DATA0.0.0.0.0 0,0.0 24.60.90.90.60.24,36.66
5 DATA8.8,28.62.28.62.62.127.9.8.3.3,8.8,8.0
6 DATA137 33 1??.48.16 66 9.131.255,255.255,255,255.255.255,255.255.255,255.999
10 PRINT"                                                 ........\      /......."
11 PRINT"
12 POKE8153,34:POKE...75 10:Z=40
13 POKE36879,8:PRINT"                          "
14 PRINT"                                  PLANET INVADER "
15 PRINT"  SCORE:"SC
19 D=0
20 GETA$:IFA$=" "ANDD=0THEN29
21 FORT=1TOZ:NEXT:POKE7745+C,32
22 POKE7746+C 33:C=C+1:POKE36876.200:POKE36876.0:IFC=298THEN80
23 IFD=0THEN19
24 IFD=1THEN30
29 E=0
30 IFPEEK(6057+E)=33THEN40
31 D=1:POKE8027+E,35:E=E-22
32 IFE<-352THEN50
33 POKE8109+E.32
34 GOTO21
40 POKE8087+E 36
41 FORT=254TO120STEP-1:POKE36877 T:NEXT:POKE8109+E,32:POKE8087+E.32
42 SC=SC+10:Y=Y+1:LZ=LZ+1:IFY>1THEN60
43 PRINT"  SCORE:"SC:GOTO19
50 POKE8109+E,36:FORT=1TO10:NEXT:POKE8109+E.32:GOTO19
60 PRINT"  SCORE:"SC:C=0:Z=Z-5:Y=0:GOTO19
80 PRINT"                 GAME OVER":FORT=1TO5000:NEXT:PRINT""
81 POKE36869 240
```

Planst Invader
by Stuart Elmes

Four Stroke Engine

on Dragon 32

This gives an accurate simulation of a four-stroke engine. The animation is achieved by the repeated printing of various strings of colour.

Program notes

1-18	Text
20-150	Set up the colour strings. The rest of the program prints these strings of colour each of which represents 1 strip of the cylinder block.

```
1 CLS:PRINT@3,"        THE FOUR STROKE INTERNAL  COMBUSTION ENGINE RUNS THROUGH  A CYCLE OF FOUR EVENTS           THE FULL CYCLE FOR ONE SEPARATE CYLINDER IS  "
2 PRINT@190,"A) COMPRESSION STROKE               (PISTON RISING)":PRINT@257,"B) POWER STROKE                    (PISTON DESCENDING)":PRINT@321,"C) EXHAUST STROKE              (PISTON RISING)":PRINT@386,"D) INDUCTION STROKE
3 PRINT@421,"(PISTON DESCENDING)"
4 FOR J=0 TO 10000:NEXT J:CLS
5 PRINT@29,"EVENT (A) THE PISTON COMPRESSES THE AIR/PETROL VAPOUR IGNITION ALSO OCCURS":PRINT@161,"EVENT (B) BURNING GASES DRIVE  THE PISTON DOWN THE CYLINDER":PRINT@257,"EVENT (C) THE PISTON PUSHES OUT THE BURNT GASES"
6 PRINT@353,"EVENT (D) INLET OF NEW PETROL/ AIR VAPOUR OCCURS":FOR J=0 TO 10000:NEXT J:CLS
7 PRINT@38,CHR$(88):PRINT@40,"-PETROL/AIR VAPOUR":PRINT@134,CHR$(151):PRINT@136,"-IGNITION OF GASES":PRINT@230,CHR$(102):PRINT@232,"-EXHAUST GASES":PRINT@326,CHR$(223):PRINT@328,"-PISTON":PRINT@422,CHR$(175):PRINT@424,"-CYLINDER BLOCK
8 FOR J=0 TO 10000:NEXT J:CLS
9 PRINT@133,"THE FOLLOWING EXAMPLE IS OF     A FOUR CYLINDER, FOUR STROKE    ENGINE HAVING A FIRING SEQUENCE OF 1,3,4,2   FOR J=0 TO 9000:NEXT J:CLS:PRINT@230,"PRESS 'BREAK' TO STOP":FOR J=0 TO 9000:NEXT J
10 CLS(1)
11 PRINT@0,"FOUR STROKE CYCLE
20 A$=CHR$(175)
30 B$=CHR$(128)
40 C$=CHR$(223)
50 D$=CHR$(151)
60 E$=CHR$(207)
70 F$=CHR$(102)
100 G$=A$+A$
110 H$=A$+A$+A$+A$+A$
120 I$=G$+B$+B$+G$
130 J$=C$+F$+F$+C$
140 K$=B$+B$+B$+B$
150 L$=E$+E$+E$+E$
160 M$=F$+F$+F$+F$
200 PRINT@180,[illegible]
210 PRINT@230,[illegible]
215 PRINT@134,CHR$(143)
220 PRINT@288,[illegible]
225 PRINT@134,CHR$(143)
230 PRINT@292,[illegible]
240 PRINT@230,[illegible]
250 PRINT@356,[illegible]
260 PRINT@388,[illegible]
270 PRINT@420,[illegible]
300 PRINT@288,[illegible]
310 PRINT@292,[illegible]
320 PRINT@324,[illegible]
330 PRINT@356,[illegible]
340 PRINT@388,[illegible]
350 PRINT@420,[illegible]
400 PRINT@288,[illegible]
410 PRINT@292,[illegible]
420 PRINT@324,[illegible]
430 PRINT@356,[illegible]
440 PRINT@388,[illegible]
450 PRINT@420,[illegible]
455 PRINT@288,[illegible]
460 PRINT@292,[illegible]
465 PRINT@324,[illegible]
470 PRINT@356,[illegible]
475 PRINT@388,[illegible]
480 PRINT@420,[illegible]
495 PRINT@146,CHR$(51)
500 PRINT@288,[illegible]
505 PRINT@146,CHR$(143)
510 PRINT@292,[illegible]
520 PRINT@324,[illegible]
530 PRINT@356,[illegible]
540 PRINT@388,[illegible]
550 PRINT@420,[illegible]
600 PRINT@288,[illegible]
610 PRINT@292,[illegible]
620 PRINT@324,[illegible]
630 PRINT@356,[illegible]
640 PRINT@388,[illegible]
650 PRINT@420,[illegible]
700 PRINT@288,[illegible]
710 PRINT@292,[illegible]
720 PRINT@324,[illegible]
730 PRINT@356,[illegible]
740 PRINT@388,[illegible]
750 PRINT@420,[illegible]
755 PRINT@288,[illegible]
760 PRINT@292,[illegible]
765 PRINT@324,[illegible]
770 PRINT@356,[illegible]
775 PRINT@388,[illegible]
780 PRINT@420,[illegible]
795 PRINT@152,CHR$(52)
800 PRINT@288,[illegible]
805 PRINT@152,CHR$(143)
810 PRINT@292,[illegible]
820 PRINT@324,[illegible]
830 PRINT@356,[illegible]
840 PRINT@388,[illegible]
850 PRINT@420,[illegible]
900 PRINT@288,[illegible]
910 PRINT@292,[illegible]
920 PRINT@324,[illegible]
930 PRINT@356,[illegible]
940 PRINT@388,[illegible]
950 PRINT@420,[illegible]
1000 PRINT@288,[illegible]
1010 PRINT@292,[illegible]
1020 PRINT@324,[illegible]
1030 PRINT@356,[illegible]
1040 PRINT@388,[illegible]
1050 PRINT@420,[illegible]
1055 PRINT@288,[illegible]
1060 PRINT@292,[illegible]
1065 PRINT@324,[illegible]
1070 PRINT@356,[illegible]
1075 PRINT@388,[illegible]
1080 PRINT@420,[illegible]
1095 PRINT@140,CHR$(50)
1100 PRINT@288,[illegible]
1110 PRINT@292,[illegible]
1115 PRINT@140,CHR$(143)
1120 PRINT@324,[illegible]
1130 PRINT@356,[illegible]
1140 PRINT@388,[illegible]
1150 PRINT@420,[illegible]
1200 PRINT@288,[illegible]
1210 PRINT@292,[illegible]
1220 PRINT@324,[illegible]
1230 PRINT@356,[illegible]
1240 PRINT@388,[illegible]
1250 PRINT@420,[illegible]
1300 PRINT@288,[illegible]
1310 PRINT@292,[illegible]
1320 PRINT@324,[illegible]
1330 PRINT@356,[illegible]
1340 PRINT@388,[illegible]
1350 PRINT@420,[illegible]
1400 PRINT@288,[illegible]
1410 PRINT@292,[illegible]
1420 PRINT@324,[illegible]
1430 PRINT@356,[illegible]
1440 PRINT@388,[illegible]
1450 PRINT@420,[illegible]
1600 GO TO 215
65020 COPYRIGHT J B SOFTWARE 2 JUNE 83
```

Four Stroke Engine
by J Bateman

Shark

on BBC

This is a program to help young children learn their tables. A picture is drawn of a man and a shark. You are asked 10 questions. Every time you get a question wrong the shark gets closer to the man. If five wrong answers and the man gets eaten.

Program notes

100-168	Main program loop
170-218	Graphics characters
220 278	Instructions
288 398	Sets up screen
400-458	Procedure for correct answer
460-548	Procedure for wrong answer
550-658	Was man eaten?

```
 10 ONERROR GOTO 30
 20 PROCVAR
 30 MODE 7
 40 PROCINSTR
 50 MODE 2
 60 Q=0:S=6:CLS
 70 PROCSCREEN
 80 IF Q=10 PROCFIN
 90 Q=Q+1
100 COLOUR 3:PRINTTAB(5,19)"QUEST
    ION ";Q
110 A=RND(12):B=RND(12)
120 PRINTTAB(13,22);"   "
130 PRINTTAB(5,22);A;" TIMES ";B
140 INPUT P:IF P=A*B THEN PROCCOR
    RECT ELSE PROCWRONG
150 PROCFIN
160 END
170 DEFPROCVAR
180 VDU 23,225,255,255,255,255,255,
    255,255,255
190 VDU 23,226,130,130,186,186,186,
    146,254,124
200 VDU 23,227,32,48,56,60,126,127,
    127,255
210 ENDPROC
220 DEFPROCINSTR
230 PRINTTAB(12,2)CHR$141CHR$133"
    S H A R K":PRINTTAB(12,3)CHR$
    141CHR$133"S H A R k"
240 PRINT''''''''"You will be asked
    10 multiplication sumsEvery
    time yo get one wrong the shark
    will get nearer your man.You
    must try tosave the man from be
    ing eaten by the    shark."
250 PRINTTAB(10,20)CHR$130"PRESS
    THE SPACE BAR":G$=GET$
260 IF G$=" " THEN 270 ELSE 260
270 ENDPROC
280 DEFPROCSCREEN:GCOL 0,3
290 MOVE 190,800:DRAW 1090,800:
    DRAW 1090,510:DRAW 190,510:DRAW
    190,800
300 COLOUR 6
310 FOR X=3 TO 16:PRINTTAB
    (X,11)CHR$225:NEXT
320 FOR X=3 TO 16:PRINTTAB
    (X,12)CHR$225:NEXT
330 FOR X=3 TO 16:PRINTTAB
    (X,13)CHR$225:NEXT
340 FOR X=3 TO 16:PRINTTAB
    (X,14)CHR$225:NEXT
350 FOR X=3 TO 16:PRINTTAB
    (X,15)CHR$225:NEXT
360 COLOUR 5:PRINTTAB(12,10)CHR$226
370 PRINTTAB(6,2)"S H A R K"
380 COLOUR 4:PRINTTAB(7,10)CHR$227
390 ENDPROC
400 DEFPROCCORRECT
410 COLOUR 2
420 PRINTTAB(6,24);"CORRECT"
430 FOR T=1 TO 80 STEP 4:SOUND 1,
    -15,T,1:NEXT
440 FOR T=1 TO 1000:NEXT T:PRINTTAB
    (6,24);"          ":GOTO 80
450 ENDPROC
460 DEFPROCWRONG
470 COLOUR 2
480 PRINTTAB(7,24);"WRONG"
490 SOUND 1,-15,50,5:SOUND 1,-15,
    2,20
500 FOR T=1 TO 1000:NEXT:PRINTTAB
    (7,24);"       "
510 COLOUR 4
520 S=S+1:PRINTTAB(S,10);"
    ";CHR$227
530 IF S=11 THEN 540 ELSE 80
540 FOR D=1 TO 2000:NEXT:ENDPROC
550 DEFPROCFIN
560 FOR T=1 TO 2000:NEXT T:COLOUR
    3:CLS:IF Q=10 PRINTTAB(1,10)
    "WELL DONE !" ELSE 620
570 COLOUR 6
580 PRINTTAB(1,12)"YOU SAVED
    THE MAN"
590 FOR T=50 TO 100 STEP 4:SOUND 1,
    -15,T,1:NEXT:FOR T=100 TO 50
    STEP -4:SOUND 1,-15,T,1:NEXT
600 COLOUR 3:PRINTTAB(3,20)"ANOTHER
    GO ?":G$=GET$
610 IF G$="Y" THEN 60 ELSE 600
620 PRINTTAB(1,10)"NOT VERY GOOD !"
630 SOUND 1,-15,60,10:SOUND 1,-15,
    30,10:SOUND 1,-15,15,12:SOUND
    1,-15,5,25
640 COLOUR 6
650 PRINTTAB(1,12)"THE MAN GOT
    EATEN"
660 COLOUR 3
670 PRINTTAB(3,20)"ANOTHER GO ?"
    :G$=GET$
680 IF G$="Y" THEN 60 ELSE 670
```

Shark
by Philip Woodley

Hold

on Spectrum

This program provides a hold/copy feature The program uses the Spectrum interrupts as in Bill Longley s program on page 33, vol 2, no 24 of *PCW* After typing in and saving on tape, the program should be run *Randomise Usr* 65120 should be entered to start the routine and your program can then be loaded To hold the program simply press *Caps lock* and H, and S to restart Pressing *Caps lock* and C copies the current screen display by calling the ROM copy routine at address 3756.

This program was written for the 48K Spectrum To use the routine on a 16K Spectrum, change the *For Next* loop to FOR g = 32339 TO 32395, and the second byte of code from 9 to 40 Also if the program crashes try removing any penpherals (excluding printer)

```
 5 CLEAA 55120
 10 FOR g=65120 TD 65175  AEAD
a  POKE g,a  NEXT g
 15 DATA 62,9,237,71,237,94,20
,0,0,255,243,245,229,205,116,25
,225,241,251,201,62,254,219,254,
203,71,192,62,191,219,254,203,10
3,40,9,62,254,219,254,203,95,40,
10,201,62,253,219,254,203,79,32,
248,201,205,172,14,201

"RANDOMIZE USA 66120 ACTIVATES
 THE ADUTINE DN A 46K SPECTAUM"

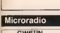
"AANDOMIZE USA 32339 ACTIVATES
 THE ADUTINE DN A 16K SPECTAUM"
```

```
66120 LD   A,9
55122 LD   I,A
65124 IM   2
65126 AET
66127 NDP
65125 NDP
65129 AST  56
65130 DI
65131 PUSH AF
65132 PUSH HL
65133 CALL 65148
65136 POP  HL
66137 PDP  AF
55135 EI
65139 AET
65146 LD   A,254
65142 IM   A,(254)
66144 BIT  0,A
65145 AET  NZ
65147 LD   A,191
65149 IN   A,(254)
65151 BIT  4,A
65153 JA   Z ,55164
65155 LD   A,254
55157 IN   A,(254)
65159 BIT  3,A
65161 JR   Z ,65173
66163 AET
65154 LD   A,253
66166 IM   A,(254)
65165 BIT  1,A
66170 JA   NZ,65164
66172 AET
65173 CALL 3756
55175 AET
```

Hold
by Nicky King

Microradio

GW6JJN



Ideas forum

This column is a forum for your ideas as well as mine and a place where information is to be shared and the great cause of Microradio sustained To this end I will deal with some of your input to the column

I have received a letter from SP Electronics of 48 Linby Road Hucknall, Notts who tell me how wonderful the Microradio column is They then mention the fact that they are amateur radio and computer dealers who offer servicing on a range of equipment including radio equipment Sinclair, Dragon and BBC computers Since I have a lot of letters from people asking about RTTY equipment for their micros, it is nice to hear from a source

SP stock a program suite for RTTY on the BBC and are working on one for the Sinclair and Dragon range In addition, they stock a range of programs for the radio amateur which I will happily review if they care to show them to me I would also like to review their RTTY system, all I need is a BBC computer and the software   this is asking a lot, still, one can dream Their phone number is Nottingham 640377 Good on yer, Mick, Hilary and Rob

Many of you are interested in RTTY and I have touched upon this subject in past issues I hope to review some equipment when I can lay my hands on some If any of you run RTTY with a micro, please send me details of the system you use and the micro concerned I would be pleased to learn how well or how badly it works Anyone who has a system of their own, or market a system for RTTY, I would be happy to give it a review Lots of people are interested Not least me

Some weeks ago I mentioned Ramtop whose address is The School Wellingborough Northants NN8 2BX (please send a SAE if you write to them) This is a very good users group for radio computing enthusiasts They offer a monthly newsletter which contains some unbelievable goodies, as does the Sinclair Users Group (SAE to Sinclair Amateur Radio Users Group, 3 Red House Lane, Leiston Suffolk IP16 4JZ) Programs for Sinclair radio enthusiasts are regularly contributed and this answers the question that I am constantly asked 'Where do I get the programs?' The latest Ramtop newsletter contains morse and RTTY programs to type in for the BBC computer as well as the TRS80 which is well supported So now you know

Ramtop is the group for all micros and Sarug is the Sinclair group Both are affiliated to each other These are nonprofit making groups there to serve the computing radio enthusiast, just like Microradio

Keep the input coming I am still trying to answer all the letters and I'll get round to everyone sooner or later, so have no fear See you soon ■

Ray Barry GW6 JJN

This series of articles is designed for radio and microcomputer enthusiasts alike If you have any queries that you want answered hints and tips to share or topics that you would like to see covered write to Ray Barry, *Microradio Popular Computing Weekly* 12-13 Little Newport Street, London WC2R 3LD

SOFTWARE FOR SPECTRUM AND ZX81

OUR POLICY

We aim to create programs which you will keep on using until your computer wears out. You won't find our programs in the top ten and you will look in vain for colour adverts and fancy packaging. Nevertheless we have built up a solid following of discerning users in all parts of the world. Read the reviews of our programs if you can find them. We have been consistently praised for quality, originality and value for money.

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The bulk of our cassettes are now made by the factory which produced the Horizons tape. Programs are recorded twice and carry on the reverse side an audio narrative to supplement the operating instructions. Where appropriate, cassettes are accompanied by a comprehensive and clearly written instruction manual.

48K SPECTRUM

"Day of the Match" £5.00

Fascinating and realistic simulation of an entire football season. Name your own teams if you wish (English league provided on cassette). Rate each team from one to nine in various success categories such as attack, defence, manager, etc. Watch the season unfold. Includes knock-out cup option.

"Ball by Ball" £5.00

Simulates a test match series or one day international ames. Set up your own teams and pool of players (England v Australia provided). Rate each player's capabilities as batsman and bowler on a one to nine scale for qualities such as talent, effort, etc. Pick your teams and play the match. Electronic scoreboard shows progress of a match. Full supporting score card and series averages.

"Superplan Generator" £12.00

Spreadsheet type program with variable column width and variable number of columns. Lets you sacrifice columns you don't need to get more lines.

"Superplan Pack 1" Business Applications £7.00

Ready made applications programs for sales day book, purchase day book, cash book and petty cash book.

"Superplan Pack 2" Home computing £7.00

Ready made applications programs for home budgeting, nutrition tables, car running costs and bank statements.

"Superview" £5.00

Simple but effective information display. Up to 42 pages of text and low-res graphics. Access pages on demand or run in perpetual slide show mode. Full facilities to create your own pages and build up an information library on cassette.

16K SPECTRUM

"Superdraw" £5.00

Create full colour high-res pictures and store them on cassette for use as titles or background screens in other programs. Or just have fun doodling and build up a cassette library of your creations. Slide show option allows you to review pictures stored on cassette.

16K ZX81

Here is a selection of titles still available for ZX81. Send sae for illustrated catalogue. These are the ZX81 equivalents of the Spectrum programs described above. Although similar in concept the specifications fall short of the descriptions given for the Spectrum.

"FOOTBALL LEAGUE"	Forerunner of "Day of the Match"	£4.00
"TEST-MATCH"	Forerunner of "Ball by Ball"	£4.00
"VIDEO-PLAN"	Forerunner of "Superplan"	£7.00
VIDEO-AD	Forerunner of Superview	£7.00
VIDEO-SKETCH	Forerunner of Superdraw	£7.00

Many independent computer shops now stock our products but we continue to supply by mail order on an off-the-shelf, immediate delivery basis. Prices include VAT, post and packing in UK. Add a bit for postage if you live in Outer Mongolia. (Note "Day of the Match" not available until late October 1983.)

Video Software Ltd, Stone Lane
Kinver, Stourbridge, West Midlands
Telephone 0384 872462

PAEAN systems

Quebec Marketing PC Little Bealings
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NEW

LIGHT CYCLES *by Martin Thomas* **BBC/B** **£7.50**

A fast reaction game for the fleet of hand and mind. Can you surround the enemy with your light trace and make them crash? The better you are, the more cunning the enemy become and they increase in number and speed. Extra features introduced to challenge the high scorer. An absorbing game with excellent graphics, sound and scoreboard. Keyboard.

NEW

SCAN *by Colin Llewellyn* **BBC/B** **£7.50**

An addictive card-based game with superb graphics. The player uses his skill and judgement to place 25 of his 26 cards on a 5 × 5 grid in positions which equal or are greater than the value of the computer's cards. The problem is that the computer only discloses its cards after the player has moved, and which card is it not going to play? Progressive levels of play will tax your skill. No sound. Keyboard.

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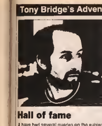
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Tony Bridge's Adventure Corner



Hall of fame

I have had several queries on the subject of the Scott Adams Adventures from frustrated Adventurers. The first Adventure in the series is *Adventureland* in which 13 Treasures have to be found. Russell Buglass has located 12 of them but is having a lot of difficulty with the last.

I think you may be looking for a necklace Russell, and the only clue I can give you comes direct from Scott Adams himself, who is not known for his frankness! *Alladin was here??? Good the lamp!* If the Dragon is still asleep, use the mirror for a clue.

Number 2 is *Pirate Adventure* which is also the subject of the Graphic Adventure we looked at at the start of this week's Corner and it is causing David Shepherdson some problems. When struggling to open the Pirate's Chest, some weird hieroglyphics appeared — *Psbl* and *Did*. I'm not quite sure how they were displayed but David asks if anyone else has experienced the same bug (if bug it be!). Incidentally David, if you're still having trouble with the chest, try pulling the nails!

It is *The Count*, however, which is causing the most problems. This is Adventure No 5 in the series, and Philip Rayner's letter is typical. Only 64 moves are allowed before sun sets and Dracula comes for you.

Philip has done quite a bit of exploring, and has found, among other pieces, a Crypt which seems to be a dead end — what use is the room, he asks. If there is a sign there, it might be an idea to read it, and note who wrote it.

This might also be an idea worth trying by Mr McBrealy of Cobham. He wants some help, but didn't tell me exactly where he was having trouble. He also points out that in reply to a reader whose letter I quoted some weeks ago (*PCW*, 29 September-5 October) the program does not recognise *Roof* but rather takes the first three letters and understands them as *Room*.

He also says that he cannot find any stairs as he keeps typing *Go stairs*. It might be worth trying *Climb stairs* in these circumstances, as the Adams Adventures quite often respond to this command rather than *Go* or *Up*. Another idea would be to go outside the Castle and *Examine* it — you never know!

Mr R Dickenson of Worksop suggests that *Stairs* may be recognised by the program as *Stake* — good thinking. Incidentally, Mr Dickenson, like many other people, is having trouble keeping his cigarettes overnight — try finding a dusty old place where Dracula cannot go!

James Haluch from the Isle of Arran, and Alex Wood from Barking both find trouble with the angry crowd outside the gate of the Castle — can anyone help them get past? Alex asks what can you possibly do with daisies, and is there a flag on the flag pole? James would also like to know how to open the coffin. Remember the oven, James!

Finally, Mr Creswell, from Catford, in London, says that, when committing suicide by jumping from the bedroom window (that's what it says here!), he noticed, on the way down, a dark window. I think the best way to get there, Mr Creswell, is to remember how escapes are sometimes made — and there must be some sheets on the bed!

Browsing through one of the monthly's a couple of weeks ago, I came across a couple of references to an Adventure I had not previously heard of. The Adventure in question is *Hell's Temple* written by Kenema Associates for the 48K Oric. Apart from a brief, but glowing mention elsewhere in the magazine, a letter appeared in the correspondence column, from the Hell's Temple Fan Club of all things. No sooner had I decided to ask readers for a mini-review than through the letterbox popped the very same from the Fan Club! The Doppel-Ganger is the President of the outfit, and writes:

"*Hell's Temple* is the best Adventure for the Oric-1 computer ... even better than *The Hobbit*! For one thing, it is original, being a mixture of strategy and luck. Strategy, in deciding which way to go, which monsters to fight, and generally what to do, and luck, in what objects you find to increase your Wealth, Strength and Spell Power ... and also if you have the misfortune to fall down a Pit! (Hang on, this sounds a bit like ... TB)

"It's basically in the 'Dungeons' style (Ah, that was it — but I thought this was unlike *The Hobbit*, original? TB), and although there are no problems to be solved, a game can last for hours, weeks or even months before you slay the great Morrigan (something I haven't done yet, and I'm President of the Fan Club!).

"Besides all that you have high-resolution graphics and 76 monsters in several different types."

Unless this is an elaborate hoax, you Oric Adventurers might find this worth looking for, if you are also a D & D'er.

Before getting on to another Hobbit Hall of Fame, another update — this time on the subject of high scores in Artic's *Inca Curse*, which I mentioned some time ago. In the same postbag I received three letters from high scorers. The first was Bruce Gavin (who is only eight — there's a great Adventuring career ahead of you!) who managed 9400 points.

Mr T D Frost wrote to inform me that in fact the highest possible score is 9950. In the same post came a letter from Billy McMillan, who assures me that 9990 is possible, the scoring reverting to 0 after this point. I've come nowhere near these exalted figures myself, so we will have to accept their comments — unless you know better.

On to HHOF

Craig Stevenson with scores of between 75 percent and 59 percent
Christopher John Fox, who is having trouble with Hewson's *Quest Adventure*. Your score of 85 (rating beginner) is a bit better than my Cave Crawler!
Steve Ellis, with 65 percent
Simon Clark, Antony Minchin and Paul Galley, with 62.5 percent
Mark Bryan Nelson, who unfortunately didn't ask the program for his score
Graham Andrew, with 89 percent
C J Fox, who sent me a polaroid shot of the last message
J C Wilkinson, with 52.5 percent and 65 percent
Andrew Broome with 70 percent
Simon Stokes and Philip Carter
Andrew Warrington, who points out that reading the book is essential to solving the Adventure. He also says that none of the bugs mentioned in The Corner so far appear to affect his copy. There may well be a de-bugged version around, Andrew, but I have not seen anything from Melbourne House to confirm that
G W Ballinger, who also mentions more Hobbitbugs — I'll go through them at a later date
Dave Wood, with a low score of 35 percent
Ian Moyse
Mr and Mrs Carl Bozicek
Simon Newell and Gavin Burrell, in three and a half hours, would you believe!
Chris and Andrew Taylor (who has also scored 1726 points playing *Hall of the Things*)
Mr X (he or she didn't give me a name) of Marple in Stockport. He or she managed to kill Smaug himself, which is unusual.

But I'm still waiting for the first BBC, Oric or Commodore owner to complete *The Hobbit*!

That's it for this week, now answer this question: *Does a Zinger have to Zing with a ZORKestra?* ■

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge, Adventure Corner, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2R 3LD



AMATEUR RADIO

Ian Henderson of Sussex Road Dagenham, writes

Q I have a Dragon 32. My brother is interested in amateur Radio (he hopes to take his test soon), can the Dragon be used to his new hobby?

A We already have a column running in *Popular Computing Weekly* for enthusiasts like your brother. However, the only program that I know of that probably might interest him is one for decoding RTTY. It decodes audio signals that are fed from the users receiver (Short Wave or VHF) directly into the cassette input on the Dragon. The program comes in a cassette version which costs £12 or a *Rom* cartridge version which costs £21. Both can be obtained from M Kerry 22 Grosvenor Road, Seaford, Sussex

WHAT IS A ULA

L Geach of Great Missenden writes

Q I was going to buy a Dragon 32, but a friend has told me that it does not have a ULA, and that this is a disadvantage. Is this true? What is a ULA?

A It will work as well as a Spectrum or BBC or any other computer that has a ULA. The Dragon uses a pair of Parallel Interface adapter chips (6821 PIAs). Without going into complex electronics the difference between the two is that a ULA is customised whereas the PIAs are off the shelf. In practice this means that there are more limitations when a PIA is used, and the actual way of handling the various input and output systems of the computer is different.

A ULA is an Uncommitted Logic Array or a Universal Logic Array. Essentially it is a chip that can be set up to act as the designer wants, of course this makes it more flexible. It does though, also bring some problems. The BBC and the Spectrum have both had ULA problems. In the Spectrum the main function of the ULA is to handle the screen, and some other input and output routines. As readers of *Popular Computing Weekly* know, an Issue 3 Spectrum with a new ULA has been bought out to solve problems of incompatability between the Spectrum and some domestic television sets.

Before a ULA has been set to a specific specification it is uncommitted. Once it has been set and is configured to a particular format it cannot be changed and is said to be 'universal'.

SPECTRUM PRINTER

Thomas Youger of Stretford, Manchester, writes

Q I want to get a printer for my ZX Spectrum, which uses proper size paper. I have £250 at the most, and at the moment it will be some time before I can get an Interface 1, which I know can be used with a printer. Interface 2 seems to have the same type of ports as the Interface 1, though it uses them for joysticks. Do I need to wait for Interface 1 or do I just need Interface 2? What does Interface 2 do exactly?

A I have printers covered in quite a lot of detail. There seems, though, to be some confusion about the role of Interface 1 and Interface 2. Unfortunately, although they both have the same design of D port, that does not mean that they are compatible. The D design is standard and each manufacturer uses it as he wishes.

A lot of people wonder why Interface 2 is necessary at all. It should have been easy to add the single chip in Interface 2 to Interface 1. Whereas the Interface 1 seems an excellent buy and well worth the wait, I think that many people will find Interface 2 very limiting. The expansion port on the back is only capable of taking a ZX Printer, and no other interface that I know of. The *Rom* slot is mapped into just 16K, the 16K used by the *Rom*. Thus only games and utilities that use less than 16K can be used. Additionally because it is mapped into the *Rom* space, useful utilities like Tasword, the word processor cannot be put into cartridge — exactly the sort of program you might want to put on it, but the program would overwrite the Basic in cartridge form.

TUNING UP

John Davies of Birkdale Avenue, Bispham, Blackpool, Lancashire writes

Q I am having a problem designing a guitar tuning program for my Spectrum. Originally I was going to simply match a tone from my computer with a guitar note. To improve on this, and to help people who are tone deaf, I was wondering if it is at all possible to use machine code to provide a display — I know that Basic would be too slow. My idea is to compare the guitar tone to the Spectrum, with a meter or something similar. If hardware is required could you publish a circuit diagram?

A This would take a dedicated article to answer properly. The main problem is finding a satisfactory way of reading the sound output from the guitar. Essentially what you are trying to do is turn your Spectrum into an oscilliscope, and even the Spectrum has its limits. You would need something like an A/D converter (analogue to digital). This would have to take a reading of the pitch over a measured time, say one millisecond, it would then take time to process this information. If you repeated this operation for about a second, you would then have about 500 values to even out and display on the screen. If you wanted to display the information, then besides allowing time to process the information in the A/D converter, further time would have to be allowed to maintain the screen display. Every fiftieth of a second the processor stops whatever else it is doing and makes sure that the screen is displaying the correct information. There are also interrupts every fiftieth of a second to refresh the *Ram*. In effect you would probably only get about 250 values a second.

As someone who is tone deaf then I can appreciate anyone trying to help, but you might find it easier in the end to just get the Spectrum to play a BEEP at the right note for a certain length of time.

MEMORY EXPANSION

Peter Fewester of Victory Road, Wisbeach, Cambridgeshire, writes

Q I have an unexpanded Vic20, and like many owners of this machine I am considering getting a memory expansion for it. What mystifies me is why should anyone buy a fixed memory expansion, when switchable memory expansions are available that will do the job of three separate memory units.

A It is very much a question of timing and market forces. If a company think they can sell a simple expansion for the same price as a switchable unit then they will, it will be cheaper to make. However, as with the question of price, market forces are such that with the growth in the Vic market that occurred until the advent of the Commodore 64, companies who were later onto the market had to offer more facilities in order to gain a market share.

I would advise that all other things being equal, you would be much better advised to choose a switchable option.

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FULLER MASTER UNIT for Spectrum, box sound and speech synthesiser amplifier joystick port cassette interface complete with demonstration cassette and box, £45 ono Tel 01-777 5935 evenings

BLABY GAMES Chopper Rescue for the 48K Spectrum Tel Lancashire (02572) 86678.

QUICK SETUP SPEAKEASY for the 48K Spectrum Tel Lancashire (02572) 86678

26IN CUSTOM-BUILT SOH JACKSON CYCLE, cost £480 plus 48K Spectrum (August 1983) swap for recent BBC Model B plus extras. Write for details M O Donnel 5 Worthington Close Palacefields Runcorn Cheshire

TRS80 MODEL 1, level 2 16K, with 100+ programs £90 sale ZX80 with ZX81 chip/keyboard and 4K Ram £20 both with manuals Write Courts 31 Longmoore Street, SW1V 1JQ London (Victoria) Tel 01-834 5592 evenings.

SWAP my Cannon AI camera (top of the range) plus electronic flash worth £360 for Commodore 64 preferably with Simons Basic Tel 0702 529431

LYNX 48K Excellent condition still under guarantee plus software user magazines and printer interface £190 ono Tel (0524) 415436 after 5 pm Will swap for Commodore 64 plus cash adjustment Tel 0524 415436

FOR SALE. 4K ZX81 plus one game (create) and a nine-month guarantee All for £40 Tel 671 1816

SPECTRUM SOFTWARE worth over £85 sell for £50 £15 of games 16 and 48K including Football Manager Time Gate Penetrator Night Flight 16K games sell £3 48K games £4.50 Tel 0662 384134 (private sale) for more details

APPLE 2 EUROBUS 48K 16K Ram 12-inch monitor dual disc drives, 80 colour card CPM and DOS operating systems, Wordstar Quickstar Calcstar Visicalc Languages basic Cobol Pascal General Leisure Accounts Fixed Assets Depreciation £2 200 Tel 0638 868134

BBC CASSETTE LEADS of all kinds from £1 50 to £3 00 and BBC games to sell or swap Tel 574 2576

SHARP PROFESSIONAL POCKET COMPUTER PC1 500 with all options for colour printer Nicads rechargeable battery mains charger unit, extra 8K Ram pack, internal back up battery fitted all leads leatherette carrying case disc console case 3 instruction manuals 12 rolls of printing paper 2 dozen printer pens all in pristine condition sell or swap around £400 value No junk given or expected Tel 01 380 6741

VIC20 16K RAM PACK, £33 various software offers Tel 0904 704151

VIC1515 PRINTER + Viewriter and 1,000 sheets paper £160 Arfon expansion unit with switched sockets and cover £80 Tel 0258 55420 (after 6 pm)

SHARP MZ 80K, interface and printer plus software with a word processor and data system Been upgraded to 48K £575 Tel 04493 7982

TWO IMAGINE GAMES Catcher Snatcher £4 and Arcadia £4 Romic Space Attack £5 Tel Kent 730394

BBC B OS1.2, 14 inch colour monitor joysticks cassette recorder leads Acornsoft games Forth Lisp books ed Beebug magazines £689 Tel East Grinstead (0342) 311851

LYNX 48K month las manual introduction tape Numerous games Lynx *Computing* Sinclair book all leads £165 ono Tel Huddersfield 38290

EPSON PRINTERS FX80 AND RX80, boxed unused unwanted guaranteed one year £423 and £300 respectively Tel 0484 775850

SOFTWARE FOR SALE or swap Spectrum I have and Tel after 2931 after 4 30 pm ask for Vince

JUPITER ACE, £45 ono Includes manual and leads Tel Pointon (0625) 879683

CASIO CT 1000 the flight case and 30 watt amplifier for a BBC Model B micro Tel Livingston Scotland 413837 after 5 30 pm

UK101 8K, cased with basic and manual good condition £80 ono Tel 021 3504746

PET 32K cassette player and many tapes Green screen large keyboard Disk-o-Pro chip computer manual Pet companion book, amazing value at £280 only just serviced May deliver first offer confirmed sale Tel 01 368 6963 (after 6 pm)

SINCLAIR PRINTER (nearly new), £25 ono two books for 1K ZX81 £4 Lots of computer magazines Ring and details Coventry (0203) 615593

JUPITER ACE, 16K ZX printer interface compatible cassette recorder books magazine articles and software £75 Tel Stafford 664786

TANGERINE MICROTAN 65 computer 7K memory proper keyboard, full Microsoft Basic assembler disassembler and can be expanded, £150 St neid (0480) 68038

MATTEL INTELLIVISION and 3 cartridges, £70 or swap for 16K ZX Spectrum Ring 675110 Bristol after 4 pm

SPECTRUM ORIGINALS, swap Jetpac Arcadia Splat Chuckie Egg 3D-Tunnel Pyramid Androids Styx Spectral INV Aquarius for Kempston joystick interface or ZX printer Sell £3 each £5 50 pair £25 the lot Tel 01 948 2053

SIMON S BASIC for Commodore 64 unused £35 ono Tel 0705 376583

PARTLY UPGRADED BBC 'A' 32K, IC69 OS1 2 £280 ono Tel Walton on Thames 244538 after 8 pm

16K ZX81 as new good quality software including Pimania Manual and leads included price £46 Tel Melinda 0206 865774 after 5 pm

MCP 40 PRINTER Colour printer plotter Perfect condition two months old. Boxed two rolls of paper Sell for £124 Tel Stevenage (0438) 356404

SHARP PC 1500 complete with extra memory 8K module CE150 printer cassette interface main adaptor replacement pens manual and ese file data base software Unused £430 new Sell for £270 Tel 01 948 8812.

£17 WORTH OF ZX MAGAZINES. Sell for £6 or swap for any Spectrum utility program Tel David on Coatbridge 0236 29806

BBC MODEL B, two months old £80 of software as new £400 Tel 644 3841

28 BASIC for your micro £2 Mastering your computer £2 Lynx Computing £2 Oric 1 and how to get the most from it! £2 50 Enter the Dragon £2 Tel David 0236 29806

INTELLIVISION VIDEO GAME plus six cartridges all in perfect condition worth over £200 Accept £120 Tel 0424 441468

FIDELITY mini century chess computer with advanced cast £42+ Tel Hornchurch 57641 after 6 pm

SPECTRUM SOFTWARE, swap or sell Arcadia, Spectrus Space Raiders and many more Tel 01 788 5728

SWORD M5 COMPUTER plus Basic I cartridge three months old hardly used with Sprite Graphics, three voice sounds unit plus excellent basic features easily expandable £135 ono Tel 01-660 3412

BEST-SELLING



Few people can have been left in any doubt that *Popular Computing Weekly* as a whole, and Tony Bridge in particular thought *Halls of the Things* by Crystal Computing was a pretty wonderful program

The follow up to that program has now been issued not by Crystal but by Puffin Books Called *The Warlock of Firetop Mountain* it is based on the best selling children s adventure book of the same name

This program is designed in much the same format as the *Halls of the Things* A maze is randomly generated by the computer and you move a little figure around it opening doors looking in chests and fighting baddies The range of commands available as well as some of the themes owe a debt to adventures but the action is all arcade

Setting the maze in the labyrinth from the book beneath Firetop Mountain is a nice way of linking the two elements of book and program

The game is fast and furious The only criticism I would make is that it is a bit similar to *Halls of the Things* — still at £5.50 it's good value You can also buy the program in a package together with the book for £6 95 and as such it could solve a Christmas present difficulty

It will be interesting to see how many bookshops stock the program/book package

Program *The Warlock of Firetop Mountain*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Penguin Books*
536 King s Road
London SW10 0UH

SOPHISTICATED

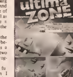
Password is a sophisticated machine code utility program for the Dragon 32

Fundamentally a disassembler, it also allows you to create and debug your own routines It is the mode of execution of the instructions that is really unusual Each instruction is executed in sequence, line by line through the routine The program uses multi-screens and has a printer dump facility for those that have a printer

A leaflet detailing the various commands available from *Password* is included and the whole package looks very useful Some previous experience with machine code programming would be helpful though, to get the most out of the program

Program *Password*
Price *£6 00*
Micro *Dragon 32*
Supplier *B Franklin*
4 Church Circle
Farnborough
Hants

MULTI-SCREEN



Ultima Zone is to the Oric what *Penetrator* was to the Spectrum — just about the most sophisticated multi-screen kill-the-aliens attack game ever

It would be ludicrous to describe the plot if that is what it has Suffice to say that if you destroy one nasty thing, you can be sure that something else even nastier will take its place

Later stages in the game feature obstacles to be avoided, as well as (of course) yet more and more aliens As is usual with Oric programs, there are two versions of the game on the tape, one saved fast and the other slow Is there anyone out there who bothers with the slow version? It cannot be thrilling sitting around for 20 minutes waiting for a program to load

Program *Ultima Zone*
Price *£8 50*
Micro *Oric 1*
Supplier *Tansoft*
Units 1 and 2
Techno Park
Newmarket Road
Cambridge

MANIPULATE

If you have the *Hisoft* or *Picturesque* assemblers then you could find the *Spectrum Screen Editor* very useful

The purpose of the program is to enable you to manipulate source code in very much the same way as a word-processor manipulates text

This means that, for example, blocks of code can be moved, a four-way cursor allows for all the assembler code to be manipulated, and a search facility means any given string can be inserted deleted or replaced

The program comes with a manual explaining the main features and commands — it's not for novices though

Program *Spectrum Screen Editor*
Price *£5 00*
Micro *Spectrum*
Supplier *K R Sheppard*
76 Harmanswater Road
Bracknell RG12 3NY

BELEAGUERED

Choplifter is a game whose reputation has produced substantial sales in this country Audiogenic has now released it on the Commodore 64 and it is graphically superb

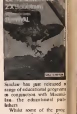
You control a helicopter and must use it to rescue beleaguered troops trapped in a building behind enemy lines

Under joystick control you guide your helicopter through the enemy territory and attempt to save as many commandos as possible It's exciting stuff and technically the game is superb

Just one problem though — it is available only on cartridge, priced at £29 95 Why is this? Commodore manages to sell its Rom software at under £10

Program *Choplifter*
Price *£29 95*
Micro *Commodore 64*
Supplier *Audiogenic*
PO Box 88
Reading
Berks RG1 2SN

A CUT ABOVE



Sinclair has just released a range of educational programs in conjunction with Macmillan the educational publishers

Whilst some of the programs are not far removed from the normal drill/routine exercises (albeit with some imaginative graphics), others are definitely a cut above the norm

Survival caters for the older pupil and aims to teach the main ideas of the theory of evolution in an interesting way Using high resolution graphics, the program enables you to choose what kind of animal you'd like to be each with its own strengths and weaknesses, and then makes you face the dangers that animal would face The object of the program survival

You must decide what your animal must do to survive (within its limitations) and in doing so learn some Darwinian theory Quite fascinating It s a pity that one of the options isn t to be a human

being that could be riveting Nietzsche eat your heart out!

Program *Survival*
Price *£9 95*
Micro *Spectrum 48K*
Supplier *Sinclair Research*
Stanhope Road
Camberley
Surrey GU15 3PS

DEBUGGING

Moder 80 is a cheap and effective assembler/disassembler for the Lynx computer — one of only a few such packages for the machine

The program is in machine code which means that it will not interfere with existing Basic programs and also makes it easy to call machine code routines from those programs

The program has all the essential features of this type of system it can handle the complete Z80 instruction set and all the *Ascii* characters, it will dump to screen, printer or tape and it has a set of error messages to help with debugging

The main commands of the program are listed in the fold-out insert that comes with the cassette

Program *Moder 80*
Price *£6 95*
Micro *Lynx*
Supplier *Seven Stars*
15 Gloucester Avenue
London NW1 7AU

SNAKE EATER



Teddy is a machine code arcade style game for the Vic20 with a bizarre plot The rather unpleasant theme is that Teddy has to eat all the snakes in his wood

Teddy, it seems is having all his picnic basket food eaten by Lake snakes Eschewing diplomacy Teddy sees eating the snakes as the only answer

There is though a right and wrong way to eat a snake — a posterior munch will kill it immediately head-on it's Teddy who will be the dinner Snakes bitten in the middle merely break in two, doubling Teddy's problems

Other features in the game include various objects that appear randomly some of which Teddy can eat for further points It's funny but somehow I never associated Teddies with nasty things like eating snakes

Program *Teddy*
Price *£5 95*
Micro *Vic20 (8K)*
Supplier *Supersoft*
CO Audiogenic
PO Box 88
Reading
Berks

OLD FAITHFUL

As Commodore 64 software supply clicks into ever higher gears, the major arcade games are starting to be covered

In fact the 64 is technically advanced enough to allow more or less perfect imitations of the arcade hits of a couple of years back — ignoring legal considerations of course — so you should be able to have your very own *Pacman* or *Galaxians* at home, complete in every detail

Solar Software has just released both of these old faithfuls on cassette

Munch Man has all the features of the original *Pacman* complete with bonus fruits, two player options and bonus munchers The game, for anyone out there who may have been asleep for five years involves steering your muncher around a maze eating dots Four ghosts chase you and your only defences are your ability to duck and dodge the ghosts and four power pills located in each corner which will enable you to temporarily munch the ghosts.

Of such things megabucks are made

Program *Munch Man 64*
Price *£7 95*
Micro *Commodore 64*
Supplier *Solar Software*
51 Meadowcroft
Radcliffe
Manchester M26 0JP

ON-SCREEN



Griffin Software have launched a range of educational packages for the BBC and Spectrum that look a cut above the usual standard of such software

For one thing, all the programs are nicely packaged in large colourful boxes For another, much effort has gone into the on-screen presentation using large well-defined letters and graphics.

Wordspell contains 116 separate word tests although you can alter the range and difficulty of the words tested by adding your own lists

Other programs in the series teach sets multiplication, division and tables

The BBC programs are priced at £9 95 and the Spectrum ones sell for £7 99

Program *Wordspell*
Price *£7 99*
Micro *Spectrum*
Supplier *Griffin Software*
Frederick Street
Birmingham B1 3HP

HIGH SEAS

Pirate is an adventure game aimed at younger children It features graphics with animation and sound rather than the incomprehensible conundrums beloved of more adult text adventures

The game is divided into two sections Part 1 places you on the high seas battling it out with other ships and steering your way through scattered islands to the shore In this section you may find hidden treasures, but you must keep clear of the rocks and reefs

There's more treasure to be found in Part 2 This is set on dry land — you must solve various mysteries and collect valuable jewels Aside from your own wits, your only real help may come from the ship's mysterious, lucky black cat

Program *Pirate*
Price *£9 25*
Micro *BBC B/Spectrum 48K*
Supplier *Chalksoft*
37 Willowslea Road
Worcester WR3 7QP

INTER-RELATED

Runelord is an adventure game for the Oric 1 It is the first module of a planned series of releases to enable you to build a collection of inter-related adventures

The game is very much in the *Dungeons* and *Dragons* mould with the option of choosing and developing the main features of your character Parts of the game are illustrated with maps and drawings

Modular Concept Peripherals — authors of the game — plan to produce later sections incorporating speech using the MCP Speech Synthesizer and the Runelord Speech chip

It sounds like bliss for the hardened adventurer or wargames player Enough information to get you started is contained inside the cassette box, but you are largely on your own

Program *Runelord*
Price *£7 50*
Micro *Oric 1*
Supplier *Modular Concept*
Peripherals
13 High Street
Clydach
Swansea

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12-13 Little Newport Street London WC2H 3LD

This Week

Program	Type	Micro	Price	Supplier
3D Graphics	Ut	BBC B	£6 95	Alsa
Acheron's Rage	Arc	Oric	£6 95	Softek
Adventuremania	Ad	Texas	£8 95	Intrigue
Android Two	Arc	Spectrum	£8 95	Vortex
Bongo	S	Vic20	£9 95	Mr Micro
Birds and the Bees	Arc	Spectrum	£5 95	Bug-Byte
Bloc Head	Arc	Dragon 32	£7 95	Dragon Data
Body Snatchers	Arc	Spectrum	£6 95	Crystal
Bowls	S	Spectrum	£5 95	Leisure Soft
Brain Train	Ed	Spectrum	£4 50	Camel Micros
Caveranfighter	Arc	Spectrum	£6 95	Bug-Byte
Cimeron Medal	Ad	Dragon 32	£7 95	Dragon Data
Confrontation	S	Spectrum	£7 95	Lothlorien
Cranky	Ed	Dragon 32	£10 95	Dragon Data
Cruise Attack	Arc	Spectrum	£6 95	Micro Gen
Defence Force	Arc	Oric	£7 95	Tansoft
Defender	Arc	Spectrum	£6 95	Micro Gen
Dracula's Revenge	Arc	Oric	£6 95	Softek
Dreadnought	Arc	Spectrum	£5 95	Lothlorien
Earth Defence	Arc	Spectrum	£6 95	Artic
Forth	Ut	Commodore 64	£29 95	Audiogenic
French is Fun	Ed	Spectrum	£6 95	CDS
House of Death	Ad	Oric	£6 95	Tansoft
Humphrey	Arc	Commodore 64	£8 95	Mr Micro
Jigsaw	S	Spectrum	£6 95	Artic
Jumpjet	Arc	Dragon 32	£7 95	Dragon Data
Knockout	Arc	Spectrum	£6 95	Micro Gen
Land of Sagan	Ad	Spectrum	£6 95	Micro Gen
Laserwarp	Arc	Spectrum	£6 50	Micro Gen
Late Count	Ed	Dragon 32	£10 95	Dragon Data
Maths 2	Ed	Dragon 32	£19 95	Ampalsoft
Maths O Level	Ed	Dragon 32	£19 95	Ampalsoft
Micro Mouse	Arc	Spectrum	£6 95	Lothlorien
Millimos	Arc	Spectrum	£6 95	Artic
Metering Costs	Ut	Spectrum	£4 95	Chip Shop
Rodent	Arc	Spectrum	£6 95	Micro Gen
Paradroids	Arc	Spectrum	£6 95	Micro Gen
Pat the Postman	Arc	Spectrum	£6 95	Micro Gen
R Nest	Arc	Commodore 64	£8 95	Audiogenic
Red Baron	Arc	Spectrum	£4 95	Lothlorien
Rommel's Revenge	Arc	Spectrum	£6 95	Crystal
Runeland	Ad	Oric	£7 95	Modular Concep
SAS Assault	Arc	Spectrum	£6 95	Micro Gen
Scram 20	Arc	Vic20	£6 95	Artic
Shaft	Arc	Dragon 32	£7 95	Dragon Data
Skullsnap	Arc	Dragon 32	£12 95	Dragon Data
Spectrum Safari	Ad	Spectrum	£6 95	CDS
Star Trek	Arc	Spectrum	£4 95	Micro Gen
Stolen Lamp	Ad	BBC B	£6 95	Lothlorien
Strike Attack	Arc	Spectrum	£6 95	Micro Mart
Super Meteors	Arc	Oric	£6 95	Severn
Super Spy	Ed	Dragon 32	£19 95	Ampalsoft
Synther 7	Ut	Dragon 32	£19 95	Dragon Data
T Kingdom Valley	Ad	BBC	£6 95	Bug-Byte
Tank Battle	Arc	Vic20	£6 95	Artic
Tee Off	S	Dragon 32	£7 95	Dragon Data
The Island	Ad	Spectrum	£7 95	Crystal
Three Dee Graphics	Ut	Dragon 32	£7 95	New Dimension
Two Gun Turtle	Arc	Oric	£6 95	Lothlorien
Ultisynth 64	Ut	Commodore 64	£14 95	Quicksilva
Viking	S	Dragon 32	£7 95	Dragon Data
Zorgon's Revenge	Arc	Oric	£6 95	IJK

Book Ends

HONEST

Well at least *Megabucks from your Microcomputer* is honest. The book's one aim to explain how directly or indirectly you can make money from computers.

At £3 35 for a book of only 66 text pages with large drawings I think that what we have here is an example of recursion. The book exemplifies its own principles perfectly.

Book *Megabucks from your Microcomputer*
Price *£3 35*
Micro *General*
Supplier *Prentice/Hall International, 66 Wood Lane End, Hemel Hempstead, Herts HP2 4RG*

USEFUL

For anyone with a BBC and a disc drive *The BBC Microcomputer Disk Companion* looks like the only book you'll need to get the most out of your system.

The book describes how discs work, and how to configure existing equipment to run with the BBC micro. Different sections deal with disc handling and disc commands.

The book also includes a number of programs to use with your disc drive some involving assembly language. A useful book.

Book *The BBC Microcomputer Disk Companion*
Price *£7 95*
Micro *BBC (+Disk)*
Supplier *Prentice/Hall International, 66 Wood Lane End, Hemel Hempstead, Herts HP2 4RG*

PRACTICAL

Sometimes justifying the fact that you have just spent a couple of hundred pounds on what looks like a small box with typewriter keys on it can be difficult. "But what use is it?" cry all your relatives in unison.

A book that might help you answer the question is *Using Your Home Computer* by Garth W P Davies. It contains nothing but practical ideas for "real" uses you might find for your micro.

The book trys to show you how to think about using a computer for specific tasks rather than actually giving you programs to type in.

A little paperback book but rather thin — 80 text pages for £3 50.

Book *Using Your Home Computer*
Price *£3 50*
Micro *General*
Supplier *Macmillan Press, 4 Little Essex Street, London WC2R 3LF*

This Week is a new section that covers all the new software coming on to the home micro market each week. All suppliers should send details of their new programs to: This Week, Popular Computing Weekly, 12-13 Little Newport Street, London WC2R 3LD

Key **Ad** — adventure/**Arc** — arcade **Ed** — education/ **S** — strategy simulation/**Ut** — utility

Top 10

BBC

1	(1)	Rocket Raid	(Acornsoft)
2	(4)	Hopper	(Acornsoft)
3	(4)	Swoop	(Program Power)
4	(7)	Alien Swirl	(Program Power)
5	(3)	Planetoids	(Acornsoft)
6	(8)	Monsters	(Acornsoft)
7	(—)	White Knight mk II	(BBC)
8	(—)	Castle of Riddles	(Acornsoft)
9	(—)	Business Games	(Acornsoft)
10	(—)	Sphinx Adventure	(Acornsoft)

All Model B.
(Figures compiled by Micromanagement, Ipswich 0473 59181)

Atari

1	(3)	Planet Fall	(Infocom)†
2	(—)	Hard Hat Mack	(Electronic Arts)‡
3	(—)	Sons of Egypt	(Datasoft)§
4	(—)	Deadline	(Infocom)§
5	(1)	Zaxxon	(Datasoft)
6	(2)	Pooyan	(Datasoft)†
7	(8)	Zork III	(Infocom)§
8	(—)	Fire Fleet	(English)†
9	(—)	Sea Dragon	(Adventure International)
10	(5)	Preppie	(Adventure International)

†32K cassette ‡32K disc §48K disc
(Figures compiled by Calisto Computers, Birmingham 021-632 6458)

Vic20

1	(4)	Arcadia	(Imagine)
2	(1)	Wizard and the Princess	(Melbourne House)
3	(2)	Wacky Waiters	(Imagine)
4	(—)	Laser Zone	(Llamasoft)
5	(10)	Matrix	(Llamasoft)
6	(—)	Gridrunner	(Salamander)
7	(3)	Skyhawk	(Quicksilva)
8	(—)	Zargon II Chess	(Commodore)
9	(—)	Money Man	(Commodore)
10	(9)	Panic	(Bug-Byte)

(Figures compiled by Boots & Co Websters)

ZX81*

1	(8)	Defender	(Quicksilva)
2	(1)	QS Asteroids	(Quicksilva)
3	(7)	Asteroids	(Quicksilva)
4	(2)	1K Chess	(Artic)
5	(8)	Space Raiders	(Psion)
6	(8)	Fantasy Game	(Psion)
6	(—)	Inca Curse	(Artic)
8	(—)	ZX Forth	(Artic)
10	(—)	Maths Revision	(Sinclair)

All run in 16K.
(Figures compiled by Bodel & Co Websters)

Spectrum

1	(1)	Lunar Jetman	(Ultimate)
2	(—)	Kong	(Ocean)*
3	(10)	3D Ant Attack	(Quicksilva)
4	(—)	Chequered Flag	(Psion)
5	(9)	Manic Miner	(Bug-Byte)
6	(—)	Jet Pac	(Ultimate)
7	(—)	AticAtac	(Ultimate)
8	(—)	Flight Simulation	(Psion)
9	(8)	ZZoom	(Imagine)
10	(—)	Splat	(Incentive)

*Requires 48K
(Figures compiled by W H Smith and Son, London)

Books

1	(1)	Advanced User Guide for the BBC Micro, *Bray-Dickens and Holmes*	(Cambridge Micro Centre)
2	(3)	36 Hour Book, *Pygmore*	(NEC)
3	(6)	Spectrum Hardware Manual, *Dickens*	(Melbourne House)
4	(—)	Spectrum Microdrive Book, *Logan*	(Melbourne House)
5	(—)	BBC Micro Disk Companion, *Latham*	(Prentice-Hall)
6	(5)	Using the 64, *Gerrard*	(Duckworth)
7	(2)	One Hundred Programs for the BBC Micro, *Gordon*	(Prentice-Hall)
8	(10)	Advanced Graphics for the ZX Spectrum, *Angell and Jones*	(Macmillan)
9	(—)	Spectrum Interfacing and Projects, *Bishop*	(McGraw-Hill)
10	(4)	Commodore 64 Programmer's Reference Guide, *Commodore*	(Commodore)

(Figures compiled by Watford Technical Books, Watford 0923 23834 Prestel 22824)
(Last week's position in brackets)

Dragon 32

1	(2)	Mined Out	(Quicksilva)
2	(10)	Pettigrew's Diary	(Shards)
3	(—)	Night Flight	(Salamander)
4	(1)	Ring of Darkness	(Wintersoft)
5	(—)	Dragonfly 2	(Hewson)
6	(—)	Gridrunner	(Salamander)
7	(5)	Champion	(Peaksoft)
8	(—)	Lionheart	(Peaksoft)
9	(6)	Frogger	(Microdeal)
10	(—)	Morocco Grand Prix	(Microdeal)

(Figures compiled by Boots & Co Websters)

Ziggurat



Replacement person

Do you know what robots are?

Apart from many other things, a "robot" is a set of traffic lights in South Africa. When traffic lights were first introduced into this country they too were called robots.

A robot in this sense is a straight replacement person — here it is replacing a police officer on point duty.

Are all robots replacement persons?

Nolan Bushnell, the designer of the first video game *Pong* has invented a robot called Topo — is Topo really a robot? Bushnell's firm is called Androbot, and a spokesperson for Androbot (UK) claims, or the press release says, a robot is basically a computer on wheels plus some software, so anyone with a home computer of reasonable power already owns the first half of a robot.

Topo the robot — so we discover — is essentially another computer-driven device and one which is only capable of movement. Topo, thus, is as much a robot as the Jessop turtle or the BBC buggy which are used in schools. Neither the turtle nor the buggy are robots, so the implication is that Topo is not a robot either.

Are remote control cars, planes, and boats robots? Most people would say not. Just because the machine is driven by a computer under a program, this does not suddenly make turtles, buggies or Topo into robots. They are simple machines.

A simple machine is an extension to the human, eg an aeroplane or a power drill. The direction of the machine is under the immediate control of a human, though there may be aspects which operate without human intervention.

A machine which operates without any human intervention (such as a Jaquard loom, a cardsorter, or an automatic press) is the next stage of the development of machines. An automatic machine is not, however, a robot.

There are those who are willing to argue that any automatic machine is effectively a simple robot, but such argument seems to contradict commonsense — or at least my commonsense. There seems to be something missing from a machine to fill bottles, something I feel should be there for a robot.

I think there are three main aspects to a robot: machine, power, control.

Machine: any robot must consist of machinery and in this a robot is no different from any other machine — a robot is a machine.

Power: for any machine to work there must be a power source, but as before this does not differentiate the robot from any other gadget.

Control: the operations of the machinery have to be controlled, and it is the form of control which differentiates the robot from the simple or automatic machine.

In a robot the control of the workings of the robot have to be programmed. By programmed I mean "not human directed", and I do not mean "repetitive". For example, a computer program is programmed but it is not always repetitive.

A computer program can produce novel results and often the novelty derives from the response to differing inputs. It is a poor computer game which always repeats itself independently of the users responses. It is a poor robot (but a typical automatic machine) which cannot accommodate to some change in the relevant environment.

It is a poor industrial robot/welder which, when the metal to be welded is akimbo, welds thin air. A robot has to respond to the environment and thus has to have ways of sensing that environment.

To sense the (relevant) environment requires some intelligence in the sensing mechanisms. To use that information derived from the environment, requires intelligence in the control program. It has to be a control program and it has to be performed by a computer, as no other device with those kinds of abilities exists.

Once we talk about computers and intelligence we are in familiar territory. ■

Boris Allen

Puzzle

Three digits

Puzzle No 85

Egbert was thinking of an unusual number which is the answer to this puzzle.

It has three digits. The sum of the first power of the first digit, plus the second power of the second digit, plus the third power of the third digit gives the number back again.

1st 2nd 3rd

If Egbert had been in an obliging mood he would have been thinking of 175 because $175 = 1^1 + 7^2 + 5^3$ and then we would have printed both the question and the answer at the same time, making the puzzle a trifle easier than usual.

Unfortunately he wasn't. Which number, or numbers, might he have been thinking of?

Solution to Puzzle No 80

The program assigns each firework price to the array *A*(5). Every possible combination of five fireworks is then selected, and if the total cost is equal to exactly one pound, the result is printed.

```
10 DIM A(5) 20 LET A(1) = 12 30 LET A(2) = 14 40
LET A(3) = 18 50 LET A(4) = 32 60 LET A(5) = 36 70
FOR B = 1 TO 5 80 FOR C = B TO 5 90 FOR D = C
TO 5 100 FOR E = D TO 5 110 FOR F = E TO 5 120
LET T = A(B) + A(C) + A(D) + A(E) + A(F)
130 IF T = 100 THEN PRINT A(B) " "A(C) " "A(D) " "
A(E) " "A(F) 140 NEXT F 150 NEXT E 160 NEXT D
170 NEXT C 180 NEXT B
```

This prints out three sets of values, but only one includes the price of a *Golden Waterfall* and only one the price of a *Depth Charge*.

Therefore, the fireworks chosen by each of the group were:

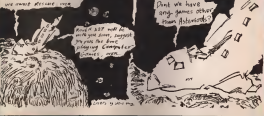
Jamie — 3 Golden Waterfalls, 2 Mine of Serpents

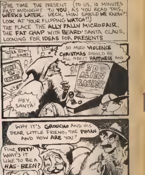
Sue — 2 Golden Waterfalls, 2 Krakatoa Cascades, 1 Depth Charge

Ben — 1 Krakatoa Cascade, 3 Fairy Fireglows, 1 Mine of Serpents

Winner of Puzzle No 80

The winner is G L Gooman, Shuthonger, Tewkesbury, who receives £10





THE TIME THE PRESENT (TO US, 10 MINUTES PAST MIDNIGHT TO YOU, AS YOU READ THIS, WEEKS LATER.. HECK, HOW SHOULD WE KNOW?! LOOK AT YOUR FLIPPING WATCH!!)
THE PLACE THE ALLY PALLY MICROFAIR.
THE FAT CHAP WITH BEARD' SANTA CLAUS, LOOKING FOR IDEAS FOR PRESENTS
SO MUCH VIOLENCE CHRISTMAS SHOULD BE ALL ABOUT HAPPINESS AND
3D ALIEN BASHER
HEY, SANTA!
WHY IT'S GROUCHO AND HIS DEAR LITTLE FRIEND, THE PIMAN AND HOW ARE YOU?
FINE, FATTY! WHAT'S IT LIKE TO BE A HAS-BEEN?
YOU'LL HAVE TO EXCUSE HIM HIS RECENT TV APPEARANCE WENT STRAIGHT TO HIS LITTLE PINK HEAD!



OF COURSE! IT'S ONLY NATURAL! AND WHO HAVE WE HERE THEN?
CONTRACT
HA! FOOL! THE TOY FACTORY AND ALL YOUR WORKERS NOW BELONG TO AUTOMATA!
WUINED!
WE'RE FROM GNOMES LIB WE'RE PETITIONING AGAINST EXPLOITATION OF OUR RACE AS GARDEN DECOR! SIGN HERE, HERE AND HERE! DON'T BOTHER ABOUT THE SMALLPRINT
PENFOLD & CROUCHER STRIKE AGAIN BUT I WAS RATHER HOPING THEY'D DO THE OLD 'SANITY CLAUSE' GAG!
IT'S A SAD STATE OF AFFAIRS WHEN SANTA CLAUS DOESN'T BELIEVE IN HIMSELF ANYMORE!
HARRO! YAKZEE YAK MAKE HUMBLE GUEST APPEARRANCE TO TERR LEADERS IF YOU NOT UNDERSTAND JOKES IN STLIP YOU NOT ARONE, COOKIES!
SO SANTA'S HELPERS ARE FORCED TO TURN OUT AUTOMATA SOFTWARE, UNDER THE SUPERVISION OF THE DREADED LURCH
IF THAT PARROT HITS ME ONE MORE TIME, I'M GOING TO SHOUT "AAARRGH!"
FANCY MAKING US TURN OUT COMPUTER GAMES! HE MUST HAVE LOST HIS MARBLES!
FASTER, SCUM!
THWACK
PIMANIA
YAKZEE
GROUCHO
MORRIS
NO I BELIEVE COMPUTER GAMES REALLY ARE MORE POPULAR NOW!
NEXT WEEK THE SHRI-MIC SHPIT-MIC-SHPIRIT OF CHRISHMAS ARRIVESH!